

LOCAL PUBLIC WORKS PROGRAM



Evaluation of the National Impacts of the Local Public Works Program

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Report G

Evaluation of the National Impacts of the Local Public Works Program

**Prepared by
Chase Econometric Associates, Inc.
for the
Office of Domestic Economic Policy Coordination**



**U.S. DEPARTMENT OF COMMERCE
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FOREWORD

This report and the supporting evaluation studies present the major results of the \$6 billion Local Public Works Program (LPW) which the Economic Development Administration (EDA) implemented in 1977. The program had two phases: LPW I at \$2 billion was initiated by Congress in the closing days of the Ford Administration, and LPW II at \$4 billion was a keystone in the economic stimulus program initiated by President Carter at the onset of his Administration.

Given the magnitude of the funds and the policy issues involved in the use of public works as a tool for stimulating the economy, it was incumbent upon EDA to carry out a thorough evaluation of the program and publicly report its findings. The Local Public Works Program -- Final Report (Report A) summarizes those findings, which are presented in detail in this study (Report G) and in the following evaluations conducted by EDA staff or outside researchers working for the Department of Commerce:

- o Analysis of Construction Employment Generation by Project Types in the Local Public Works Program (Report B)
- o Report on the Characteristics of LPW Employees (Report C)
- o On-Site Data Collection and Analysis in Support of a Microeconomic Evaluation of the Local Public Works Program (Report D)
- o The Timing of the Construction Employment Impacts of the LPW Program Relative to Local Area Employment Cycles (Report E)
- o The Net Cost of the Local Public Works Program (Report F)

Our purpose in these documents is to report on our stewardship of significant public resources and to provide guidance to future policy makers. It is EDA's practice to preface the final reports of studies conducted by outside researchers with a set of Agency comments on the content of the report. A set of EDA staff comments follows this foreword.

LPW, the largest countercyclical public works program undertaken since the depression, had three basic objectives:

- providing a stimulus to the national economy and distressed local economies;
- generating employment opportunities in construction and related industries; and
- constructing or renovating needed public facilities.

As these reports document, the program was largely successful in meeting these objectives, as well as several secondary goals. In addition, the LPW experience revealed valuable insights about a more effective structure for both an accelerated public works program like LPW and a countercyclical public works program like that advocated by the House in 1979 and 1980 as part of the expansion and extension of EDA's legislation. I will use this "Foreword" as a forum for discussing these insights, as well as outstanding issues, in the context of examining the utility of public works as a countercyclical tool, a subject that has been hotly debated for more than a decade.

At the outset, it is important to note that much of the criticism of public works as a countercyclical instrument stemming from the LPW Program is misdirected in that it was based on LPW's failure to meet objectives that were not set forth for the program. LPW, particularly LPW II which I helped design and had responsibility for administering, was not directed at soaking up large numbers of the long-term unemployed, nor was it conceived as a skill training mechanism. Moreover, since both rounds of the program were initiated long after the trough of the recession, they clearly could not perform as countercyclical measures in the classic sense.

One of the factors that is often overlooked in discussing this subject is that public works is not the only instrument in the panoply of economic or employment stimulus tools. Tax cuts, public service employment, expansion of training programs, extended unemployment insurance, and fiscal assistance aid are among the other measures which are or could be brought to bear when such micro-economic policies are called for.

There are, however, some "open" issues which need to be addressed in the use of public works as a countercyclical tool. First and foremost is the utility of traditional economic stimulus programs in the changed economic circumstances characterized as "stagflation." Certainly the advent of persistent inflationary pressures simultaneous with declining or lagging economic growth and employment must now be considered in determining the appropriateness of public works as a countercyclical effort.

In addition, there have been three historically persistent problems in using public works as a countercyclical tool, each of which is related to the difficulty in obtaining the anticipated impact within the desired timeframe. One involves the ability of Federal, State, and local governments to propose, review and initiate construction on useful public works projects within a short period of time. Under the LPW Program, it was demonstrated that this can be accomplished. A second relates to the length of time required to complete projects. Again, the LPW experience revealed that there are certain types of projects that are completed more rapidly, such as repair and renovation projects involving less than \$500,000.

A third problem relates to the timing of program initiation. Too often in the past, the programs have begun so late that the major effects are produced after the economy has turned around or at least is well on its way to recovering. Indeed, some of the impact of such programs may well have exacerbated inflationary pressures which are latent in a strong economic growth period. LPW II, for example, may well have had such an effect given the enactment and implementation of the program so many months after the 1975 recessionary trough. To counteract such lags, proposals for "automatic trigger" devices for standby public works programs have been made. The translation of this concept into an appropriate legislative and administrative mechanism, however, is fraught with difficulties. No single or group of "trigger" measurement devices can address the myriad economic considerations (e.g., inflationary factors and size of the budget deficit) that must be assessed in determining the efficacy of mounting a countercyclical public works program. Thus, even a mechanism that accurately predicts a recession before it ensues, cannot be used in isolation to trigger such a program.

The objectives of a countercyclical public works program might also be reexamined. Goals other than the traditional ones of generating a timely stimulus, creating short-term employment and providing useful facilities can be identified. For example, more labor intensive projects with greater impact on the general unemployed and long-term unemployed might be sought. More timely completion of projects might also be pursued to maximize the stimulus effort and reduce any procyclical effect. In addition, more return on the expenditures for public infrastructure might be achieved if greater emphasis were given to the rehabilitation of deteriorating public infrastructure, thereby assisting communities by bringing that infrastructure to "like new" condition and delaying full capital replacement costs.

Another set of policy issues involve the multiplicity of sub-objectives which may be appended to a countercyclical public works program, such as minority business involvement, the use of American-made materials, employment for veterans, etc. All of these are desirable and legitimate public policy objectives, but the administrative implications for a rapid implementation effort are substantial, and should be carefully weighed before such requirements are added.

As a result of my experience with LPW and other stimulus programs, I believe it would behoove the framers of any possible future countercyclical public works program to explore the possibilities of increasing the program's impact on the long-term unemployed and the rehabilitation needs of deteriorating public infrastructure. Indeed, a labor intensive public works program primarily directed at the rehabilitation and weatherization of

existing public facilities which had hiring linkages with the long-term unemployed could be considered not only as a countercyclical device, but as an ongoing, regular program. Organized training could be structured as part of the program, and the work would largely be performed through competitive bids by contractors. Only a portion of each contractor's workforce would have to be drawn from the long-term unemployed, and they would be paid a training wage. As a result of these features, such a program would continue the objectives of upgrading infrastructure and providing meaningful private sector employment experiences for the long-term unemployed. These as well as other characteristics give it obvious advantages over the Public Service Employment Program.

In closing, I would be remiss not to cite the unparalleled public administration effort involved in the implementation of the LPW Program -- an effort not explicitly documented in this report and the supporting evaluation studies. Special recognition must go to the hundreds of dedicated men and women who worked long hours and weeks in processing and managing over 10,000 public works projects. Since public praise for the civil servant is scarce, the achievements of the LPW staff have not received the attention warranted by the resulting benefits to so many communities and individuals throughout the country. To each of them, I extend my own deep appreciation and a "well done."



Robert T. Hall
Assistant Secretary
for Economic Development

EDA COMMENTS ON THE EVALUATION OF THE NATIONAL IMPACT
OF THE LOCAL PUBLIC WORKS PROGRAM

by Chase Econometric Associates, Inc. (CEAI)

As part of an expanded program evaluation effort of the Economic Development Administration (EDA), the Agency is now including an introductory section containing EDA comments and responses in appropriate evaluation reports. This innovation will ensure that the insights gained and issues raised as a result of evaluations are addressed by the Agency. It will also inform those reading a particular evaluation report of the Agency's position on it, and the response to the conclusions and recommendations.

For this particular evaluation of the national impact of EDA's Local Public Works (LPW) program, most of the EDA comments address themselves to data and/or econometric modelling problems. Specifically, several of the main substudies of this evaluation effort are based on data which are not LPW-specific and/or contain projections of anticipated trends. The use of such data within a macroeconomic model framework compounds the probability that the impact estimates will be substantially different from estimates based on actual program reporting.

1. Timing of Expenditures Substudy

CEAI used an incomplete set of LPW expenditure data as well as EDA disbursement data to estimate a pattern of expenditures over time. Subsequent EDA research has shown that the timing of disbursements is more closely related to the requirements of the local jurisdictional budgetary structures than to actual expenditure timing patterns. Further, since actual disbursement data were only available through the start of 1978 at the time of CEAI's study effort, CEAI projections were used as proxies for disbursement patterns after that date. It is unlikely that the use of such estimates and projections will provide an accurate picture of actual countercyclical impacts.

2. Employment Impacts Substudy

CEAI estimated direct employment impacts using Bureau of Labor Statistics (BLS) labor requirements coefficients. Although EDA was in the process of collecting direct employment data through the use of the Local Public Works Payroll Reporting Form (ED-746), the time frame for the CEAI study was too short to allow the provision of ED-746 data when required for the analysis schedule. The 746-based labor coefficients differ from the BLS labor requirements coefficients. A more accurate estimate of LPW direct employment is contained in the Local Public Works Program Final Report.

3. Impact on State and Local Governments

The assessment of the impact of LPW on state and local governments, the subsequent analysis of fiscal substitution, and, thus, the estimation of net employment impacts were based on data obtained from a non-random, non-stratified sample of 50 jurisdictions. This sample size, as noted on page 52 of this report, "is too small for effective statistical analysis." Abt Associates, Inc., under contract to EDA's Program Evaluation Division (PED), has undertaken a similar assessment based on a stratified sample of 100 jurisdictions, and the results are significantly different.

4. Industry, Regional, and Cyclical Impacts Substudies

Since the analyses of industrial, regional, and cyclical impacts were based on the estimated expenditure patterns and employment impacts discussed above, the conclusions of these studies are subject to the same limitations.

EXECUTIVE SUMMARY

The Local Public Works program was one of several countercyclical policies undertaken to alleviate the effects of the 1973-1975 recession. These policies—including countercyclical revenue sharing and employment and training programs—were designed to be complementary in the sense that each policy was designed to concentrate on one or more of the specific areas of distress which arose from the recession. The primary purpose of the LPW program was to create employment in the severely distressed construction industry and in the industries supplying materials and services to the construction industry. The increase in employment was expected to be targeted on areas of high unemployment. Another objective was to increase the stock of public facilities. It was hoped that the growth in public infrastructure, which had been severely curtailed in the recent past, would provide continuing benefits to the localities in which the projects were situated. Finally, the program was intended to provide increased aid to the hard pressed state and local governments through which the funds were channeled. To accomplish these goals, \$2 billion was authorized under the Local Public Works Capital Development and Investment Act of 1976, and \$4 billion was authorized under the Public Works Employment Act of 1977.¹

Both Acts specified that an evaluation of the impacts of these expenditures be undertaken. The Department of Commerce, in line with this mandate, is conducting a comprehensive three-part evaluation of the Local Public Works Program, consisting of an administrative evaluation, a microeconomic evaluation of the immediate impacts, and a macroeconomic evaluation of the national impact. The macroeconomic evaluation, carried out by Chase Econometric Associates, Inc., under contract to the Department of Commerce, is the subject of this report. The following major issues are addressed in this report:

- How large are the employment impacts?
- What industries are the primary beneficiaries?
- To what extent are states and localities assisted?
- What are the regional impacts?
- How effective is the LPW program as a countercyclical policy?

The data used in this study included results of special surveys of locality officials and contractors, results of BLS survey-based studies on construction labor requirements, LPW-specific data gathered by the Department of Commerce, (consisting of application and awards data and accounting data on actual disbursements), locality budget documents, and public data on commodity flows, construction activity, state and local fiscal conditions, and economic conditions. The analysis also employed several econometric models, particularly the CEAI Macroeconomic Model and the CEAI INFORUM (input/output) Model.

This study, as with all research efforts, is constrained by the assumptions used in formulating the questions to be analyzed (implicitly and explicitly noted in the Request for Proposal), the assumptions and limitations of the model structure used in the analysis, and any limitations inherent in the data. These constraints are not unique among research efforts. However, the reader should be cognizant of the limitations and caveats resulting from such constraints as noted in the study report.

The basic findings of the study are presented in this summary statement. More detailed discussions of both the findings and the methodologies are presented in the body of the report.

¹The Congressional Budget Office has estimated that total anti-recession employment-creation expenditure for the period FY 1974 through FY 1980—including the Comprehensive Employment and Training Act (Title II and IV); the Job Opportunities Program; countercyclical revenue sharing; the Jobs Tax Credit; and the LPW program—will be approximately \$39 billion.

Timing of Expenditures

The LPW program was implemented in two rounds. As part of the 1976 Act (Round I) \$2 billion was appropriated in October of 1976, and significant levels of expenditures began in January of 1977. Expenditure of the additional \$4 billion authorized as part of the 1977 Act (Round II) began approximately three quarters later. CEAI estimates that the following pattern of construction expenditures² will occur as a result of the combined authorizations.

- 20 percent (\$1.16 billion) in 1977
- 61 percent (\$3.60 billion) in 1978
- 18 percent (\$1.03 billion) in 1979
- 1 percent (\$0.07 billion) in 1980

Thus LPW expenditures appear to be occurring in a far more protracted fashion than was envisioned in the legislation³ and by most commentators.⁴

Employment Impacts

CEAI estimates that the LPW program will create a total addition to employment—including employment induced by the increase in macroeconomic activity, but net of substitution and crowding out effects—of approximately 192,000 person-years of work.⁵ The cost per person-year of this employment is \$31,000, which is equivalent to a net increase in employment of 3.2 person-years per \$100,000 of expenditure. This total increase in employment is estimated to be approximately equally distributed among construction industry (direct) employment, materials supply industries (indirect) employment, and induced employment. CEAI estimates that within the construction industry 63,000 person-years of employ-

ment (or 1.1 person-years for every \$100,000 of LPW expenditure) will be created. The cost per person-year of direct employment in the construction industry is thus estimated to be just under \$95,000.

These employment estimates are net of estimated substitution and crowding out. They also reflect adjustments of BLS data to allow for the effects on labor requirements of price and productivity changes over time. Based primarily upon the results of our survey, CEAI estimates that between 25 and 30 percent of LPW funds were substituted for local funds that would have been spent anyway. The LPW program, however, also induced additional construction expenditures by localities. When adjusted for these expenditures, CEAI's estimate of net substitution in LPW program construction expenditures falls to 20 percent of LPW funding.⁶ CEAI's estimate of the crowding out of private activity (derived from macroeconomic model simulations) is equal to approximately 9 percent of LPW funding. The combined effect of substitution and crowding out is a reduction in the gross employment impact of LPW expenditures of 29 percent. Gross of these adjustments, direct employment impacts were estimated to be 88,640 person-years, and total employment impacts were estimated to be 270,170 person-years. In addition, both rising wage rates and productivity over the life of the LPW program act to reduce the employment per dollar. CEAI estimates that this reduced LPW employment, as measured by the 1977 BLS labor requirements figures, by an additional 11 percent.

²Expenditures for 1977 reflect actual disbursements, for which data are available. Expenditures for other years are projected from 1977 disbursement patterns.

³The appropriation legislation stated that Round I would run through September 30, 1977, and Round II would run through December 31, 1978.

⁴Most public accounts of the LPW program imply that the program—or at least each round—is a one-year program. Thus, media description of Round II typically states that \$4 billion will be spent in 1978. This is approximately true of the LPW program overall, but only because nearly \$900 million of Round I expenditures are occurring in calendar 1978. However, it is estimated that only about two-thirds of Round II expenditures will occur during this one-year period.

⁵Due to a lack of available primary data on direct employment impacts of the LPW program, CEAI estimated direct construction employment impacts using Bureau of Labor Statistics labor requirements data. Indirect materials supply industry employment was estimated using the Chase/INFORUM input/output model's relationships. An employment multiplier to measure induced employment was derived from a macroeconomic model simulation. Both the BLS and input/output labor requirements data were adjusted for the changes in prices and productivity estimated to occur during the course of the LPW program.

⁶Because a learning process is likely to increase the degree to which local officials anticipate federal grants, CEAI cautions against using this estimate of substitution without modification to evaluate future public works programs.

CEAI's estimate of the employment impact of the LPW program is significantly lower than most other employment estimates. Nevertheless, CEAI believes that its estimates are more likely to overstate than to understate the employment impacts.⁷ CEAI attributes the differences between its estimates and those of the earlier studies to the lack of adjustment of other studies for one or more of the following factors: productivity and price changes since the time of earlier studies, substitution, and crowding out effects.

Industry Impact

The primary industry impact of LPW expenditures is, of course, on the construction industry. The total \$6 billion stimulus to the construction industry was equivalent to 3.7 percent of a single year's (1976) construction expenditures. In addition, nearly 60 percent of LPW expenditures are transmitted from the construction industry to other industries through the purchases of goods and services by contractors. The total expenditure impact of the LPW program on supply industries—including the effects at earlier stages of production—was nearly as large as LPW expenditures themselves. The net indirect employment impact is estimated to be approximately 65,000 person-years, which is slightly larger than the direct employment impact. The major industry groups benefiting most from these estimated indirect impacts are:

- Services: 37 percent of indirect expenditures (\$2,141 million) and 50 percent of indirect employment (45,946 person-years)
- Fabricated Metal Products: 14 percent of indirect expenditures (\$797 million) and 11 percent of indirect employment (10,195 person-years)
- Stone, Clay, and Glass: 12 percent of indirect expenditures (\$671 million) and 11 percent of indirect employment (10,195 person-years)

- Metals: 10 percent of indirect expenditures (\$598 million) and 7 percent of indirect employment (6,406 person-years)

- Machinery: 7 percent of indirect expenditures (\$372 million) and 6 percent of indirect employment (5,591 person-years)

- Lumber and Wood Products: 5 percent of indirect expenditures (\$293 million) and 5 percent of indirect employment (4,344 person-years)

Relative to the size of the affected industries, and to their cyclic distress, the LPW program was extremely small. The impact of the LPW program in its peak year (1978) exceeded 0.4 percent of annual shipments for only two industries.⁸ In both of these cases the impact was approximately 1 percent of industry shipments. In only four cases was the total stimulus of the LPW program greater than 10 percent of the decline in output suffered in the 1973-1975 recession,⁹ and in no case was the total stimulus higher than 17 percent.

Impact on State and Local Governments

A variety of trends and cyclical factors suggests that state and local governments were in need of assistance at the time of the inception of the LPW program. Resistance to state and local government expenditures, and to the tax burden that financed them, appears to have been growing for several years. The 1973-1975 recession hit state and local governments especially hard, and this distress lasted nearly two years after most sectors of the economy had begun to recover. Local fiscal distress was further exacerbated by well publicized financial difficulties in a few cities. Because of size, inherent nature, and/or the flexibility that exists in locality budgeting processes, construction expenditures are likely to be the type of locality expenditure most adversely affected by fiscal distress. In actuality, real state and local construction expenditures had been steadily declining since 1968.

⁷ Some adjustments—especially a rounding up of the employment multiplier—were made to allow for possible error. Moreover, an alternative calculation of direct employment impact, based on CEAI's macroeconomic simulations for the LPW program, suggests that direct LPW employment was about 75% of the level estimated by CEAI and reported here.

⁸ Cement and Clay Products and Structural Metal Products.

⁹ Electrical Machinery, NEC (16.9%); Structural Metal Products (16.7%); Plastic Products (11.9%); and Cement and Clay Products (11.0%).

The pattern of construction expenditure financed by LPW funds differs from that of normal locality expenditure in a manner which suggests that in many cases it is unlikely that LPW projects would have received local funding in the absence of the LPW program. In general, LPW funds appear to be used disproportionately for types of projects which tended to be:

- without obvious alternative sources of funding
- relatively easy to defer
- not visible enough to sustain active public support

The LPW program's assistance to local governments was substantial, as compared with the baseline pattern of construction expenditures. CEAI estimates that LPW funding was equal to approximately 30 to 40 percent of one year's (1976) expenditure on construction by surveyed localities. It represented a substantially larger share of one year's estimated discretionary capital expenditure—about 75 percent for cities, and 35 to 45 percent for counties and school districts. The estimated 20 percent of all LPW funds which were substituted for local funds acted to reduce the financial distress of localities by approximately \$1.2 billion.

Among the specific questions addressed in this study was the issue of the amount of LPW funding for different types of localities relative to their fiscal distress. In order to assess the overall relative fiscal impacts, CEAI compared LPW funding with total (capital and operating) expenditures by type of locality. Per dollar of normal expenditures, cities received three times as much LPW funding as counties and four times as much as school districts. If the growth of expenditure is considered, the differential is even greater; the ratio of share of LPW funds to growth rate of expenditures for cities is nearly five times the ratio for school districts and over

five times the ratio for counties. Because of declining student populations, the small share of funds provided to school districts may be appropriate. Moreover, the fiscal distress¹⁰ of cities—particularly certain individual cities—does appear to have been the most severe of any type of locality. This, for example, is probably a significant factor in the relatively slow growth rate in city expenditures. Nevertheless, the evidence on relative locality distress does not provide a clear indication that cities as a class faced fiscal pressures that were several times as great as those faced by counties. In CEAI's judgment, therefore, the data indicate that counties as a class may have received disproportionately little LPW funding relative to cities.

Regional Impacts

LPW funds were allocated primarily on the basis of unemployment measures of state and sub-state areas. In absolute dollar amounts LPW program expenditures are concentrated in the industrialized states of the North Atlantic and Great Lakes area and in the Southwest.¹¹ Much of this variation, however, corresponds to great variations in population and in economic activity among regions. A major policy issue is what regional impacts of LPW are relative to the regional contributions toward funding of the program. Regional personal and income tax payments were therefore used as a standard of comparison against which the regional impacts of the LPW expenditures were measured. All parts of the country except the Great Lakes and the Mid-South Atlantic regions received a somewhat larger share of LPW awards than their shares of personal income tax payments. This excess of LPW share over tax share was the greatest in the North Pacific and Midwest regions (the plains and mountain states of the West). The Great Lakes and Mid-South Atlantic states received only about 70 percent of their tax share of LPW awards.

Consideration of the regional impacts is incomplete without including the effects of inter-regional flows of

¹⁰CEAI's assessment of fiscal distress is based on an analysis of the joint movement of a number of variables, including locality expenditures (and construction expenditures in particular), revenues, surpluses, changes in locality interest rates, and level of locality interest rates relative to other types of interest rates.

¹¹As part of the analysis, CEAI defined a new set of regions, based on relative cyclical unemployment characteristics. Both the definitions and names of these regions are somewhat different from those with which the reader will be familiar. The definitions of regions and the precise results are presented in Chapter 7.

expenditures that resulted from the LPW program. CEAI's analysis suggests that these flows were confined almost exclusively to materials purchases from manufacturers by distributors, and that they are relatively small—averaging about 5 percent of the LPW expenditures on a regional basis. Two factors appear substantially to have determined the size of the net flows from a region.

- States that are relatively industrialized tended to experience net inflows of expenditures (i.e. net materials exports to other regions)
- States that received shares of LPW funds that were larger than their shares of shipments of manufactured goods tended to experience net outflows of expenditures (i.e. net materials imports from other regions)

The net impact of materials expenditure flows was generally to make the regional shares of LPW program impact more nearly equal to the region's personal income tax shares than are the shares of awards. In particular, the Great Lakes region was a net exporter of materials which raised the relative impact of the LPW program from 70 to 85 percent of the region's tax shares. The ratio of share of net LPW impact (after inter-regional expenditure flows) to share of taxes¹² for each region is as follows:

- 1.14 for the North Atlantic Region
- 0.85 for the Great Lakes Region
- 0.60 for the Mid-South Atlantic Region
- 0.98 for the South Atlantic Region
- 0.97 for the Midwest Region
- 1.05 for the Southwest Region
- 1.39 for the North Pacific Region

The major results with respect to regional income distribution are: The Northeast and the Southwest

were both slight net beneficiaries of the LPW programs. On a relative basis, the North Pacific states were the greatest net beneficiaries. The Great Lakes states and mid-south were—at least on the basis of personal income tax—substantial net contributors to the LPW program.

Cyclical Impact of the LPW Program

The LPW program was conceived as a counter-cyclical program. In order to assess its potential countercyclical efficacy if implemented one quarter after identification of the recession, CEAI used macroeconomic simulations to analyze the effects of the LPW program under the assumption that it had been started in 1974, rather than in 1977. Under these assumptions, it was found that a timely construction grants program could have been an effective countercyclical program for the 1973-1975 recession. In the first place, more jobs would have been created. CEAI's simulations suggest that about 9 percent more construction employment (approximately 5,500 person-years) and over 13 percent more overall employment (approximately 25,800 person-years) would have resulted from the earlier timing of the program. Moreover, these jobs would have been created in the depth of the recession. The actual LPW program, however, was not implemented in this timely fashion. LPW expenditures commenced:

- Thirteen quarters after the 1973 peak (i.e. after the beginning of the recession);
- Nearly eight quarters after the recovery began in 1975;
- Nearly two quarters after the state and local government recovery began; and
- Up to a year after most affected materials supply industries had regained their previous peak levels of production.

The maximum level of impact of the LPW program occurred in mid-1978—about six quarters after expenditures began. By the time this maximum level of expenditure was achieved:

¹²A value of unity for this ratio indicates that a region benefited from net LPW impact to the same degree that it contributed to the program's financing in the form of personal income taxes. A value greater than unity (e.g. 1.14) indicates that the region's beneficial impact was greater (in this example 14% greater) than the personal income tax contribution. A value of less than unity (e.g. 0.85) indicates that a smaller benefit (in this example 15% smaller) than the tax contribution.

- The overall unemployment rate had already fallen by a third;
- The unemployment rate in construction had fallen by well over half; and
- Output of the affected materials supply industries averaged 7 percent above previous peak levels.

The LPW program impacts will taper off during 1979, with only 19 percent of expenditure estimated to occur after 1978, and only about 6 percent after the first half of 1979. During the period:

- Overall unemployment is forecast to rise;
- Unemployment in construction, which has already begun rising, is forecast to rise further; and
- The economy is given nearly a 50 percent chance of experiencing a recession.

Thus, the pattern of LPW expenditure is one of starting and building up after the recovery is well under way, reaching its highest levels when the economy is strong, and terminating as the economy is expected to weaken. This pattern is strongly procyclical, rather than countercyclical.

This finding points to the need to encourage expeditious implementation of possible future programs of this type, which are initiated for countercyclical purposes. Means of expediting implementation must be explored with great care, however, since they may present problems of their own. CEAI's research and survey experience on this program suggests, for example, that a stand-by program of this nature—or even a reasonable certainty that such a program would be enacted on a discretionary basis—may lead to very high levels of substitution. Although this might not compromise the countercyclical efficacy of such a program, it could greatly reduce the net aid given to state and local government and to the construction industry and related industries.

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INTRODUCTION

This report is organized by chapter and prefaced by an executive summary. Chapter 1 summarizes the legislative history and intent of the LPW program and provides a chronology of events leading up to and including the implementation of the program. A brief discussion of the policy issues to be addressed in the study is also presented.

The methodology used to assess the impacts of the LPW program is addressed in Chapter 2. The first part of the chapter discusses the general methodology utilized in the study. Documentation of the data used is presented, and the survey procedure by which some data were collected is outlined. A description of the models employed in the analysis is included. The second half of the chapter discusses the specific methodologies used to evaluate the timing of the expenditure; to estimate direct, indirect, and induced employment impacts; to assess the impacts on state and local governments and on industry; and to determine the effect of inter-regional flows of expenditures.

Chapter 3 traces the path of the LPW funds, describing the uses, restrictions, and the side effects of the expenditures. The chapter focuses particularly on the two major side effects of LPW expenditures -- substitution and crowding out. The question of how much federal money was substituted for local funds, and for what purpose it was used, are addressed. Also discussed here are the implications for counter-cyclical policy of inter-temporal substitution. The extent to which other economic activity is displaced by the injections of government expenditure into the economy is assessed in the analysis of crowding out, and an estimate of the extent of crowding out is presented.

Estimates of the employment impacts of the program are reported in Chapter 4. Total employment created is divided into three categories: direct, (construction industry employment), indirect, and induced employment. These estimates are compared to estimates presented in other studies.

Chapter 5 discusses the impact of LPW expenditures on industry, particularly on material supply industries. The effect of the expenditures on each major supply industry is analyzed in terms of the price and employment impacts. The estimated timing of the expenditures is also scrutinized with respect to the position of the industrial cycle. Finally, the size of the LPW program impact is compared to the size of industry output and its fluctuations.

The effects of the LPW program on local governments is the topic of discussion in Chapter 6. An assessment of the relative fiscal situations of different types of local governments at the time of the implementation of LPW is offered. In addition, the estimated timing of LPW expenditures is compared to the cyclic position of local governments in order to determine whether the timing of the LPW program was optimal for local governments. The question of the funds by local governments is addressed, and the impact by type of locality is discussed. The chapter concludes with a comparison of the relative degrees of fiscal distress and benefits from the program of different types of localities.

The geographical distribution of the impacts of government expenditure programs have important policy ramifications involving issues such as regional economic development, equity, and the reduction of differentials in the level of unemployment. The inter-regional impacts of LPW expenditures are studied in Chapter 7. Figures on the incidence of LPW expenditure, the net inflow of materials expenditure, and the net impact of LPW expenditure are presented for each state. In order to gain a picture of the net redistributive effects of LPW expenditures by region, regional shares of total LPW awards, and total awards minus net flows of materials are compared to regional shares of total U.S. income taxes. The efficacy of targeting funds toward small pockets of unemployment is discussed, and policy implications are presented.

Chapter 8 presents discussions of several varied issues important to the study of LPW impacts. Local Public Works as a counter-cyclical program is assessed, an analysis of the potential counter-cyclical effect of an LPW program is discussed, and the inflationary impact is considered.

Chapter 9, which concludes the report, focuses on the condition and availability of relevant data. Areas for further research are also suggested.

CHAPTER 1: SUMMARY OF THE LPW PROGRAM

The Local Public Works (LPW) program is really a combination of two programs. The first program, generally known as Round I of the LPW program, was authorized by the Public Works Employment Act of 1976. The second program, known as Round II of the LPW program, was authorized by the Public Works Employment Act of 1977. As a closed end grant public works program, LPW was designed to reduce unemployment (especially in the construction industry and in distressed regions), to increase the nation's infrastructure, and to aid local governments. Together the two Acts provided \$6 billion of direct federal grants to state and local jurisdictions. In Round I \$2 billion of appropriations were used to fund 2,010 projects. In Round II 8,542 additional projects were funded for \$4 billion.

Legislative History of the Program

On July 23, 1976, the Congress overrode President Ford's veto of the Public Works Employment Act of 1976. This Act authorized \$2 billion of counter-cyclical assistance in the form of construction grants to state and local governments for public works projects to be used in the period ending September 30, 1977. On May 13, 1977 President Carter signed the Public Works Employment Act of 1977 into law. Title I of this law expanded the total authorization of public works funds by an additional \$4 billion and permitted expenditures through the period ending December 31, 1978. A chronology of the events relating to the legislative and early administrative history of the LPW program is supplied in Table 1-1.

Implementation of the Act

To implement the LPW program, the Secretary of Commerce, through the Economic Development Administration (EDA), is authorized to make disbursements to any state or local government for projects planned prior to the grant and meeting the basic criteria set forth in the Act. The bills provide the Secretary with the flexibility to tailor the programs to local needs. In order to increase the timeliness of the aid, the Round I projects are required to have "on-site labor begin within ninety days of project approval."¹ Also, to minimize delay, the legislation requires that "the secretary shall make a final determination with respect to each application for a grant submitted to him under the Act no later than the sixtieth day after the date he receives such application."² In order to "target" the program toward the areas of greatest need, the 1976 Act requires that in geographically allocating funds "the Secretary shall consider other factors: (1) the severity and duration of unemployment in proposed project areas, (2) the income levels and extent of unemployment in proposed project areas, and (3) the extent to which proposed projects will contribute to the reduction of unemployment."³ More specifically, the law requires seventy percent of LPW funds to be allocated to "applications

¹ Public Law 94-369, Title I, Sec. 106(d)

² Ibid., Sec. 107.

³ Ibid.

TABLE 1-1
L.P.W. CHRONOLOGY

2/13/76	Ford vetoed HR 5247 (a \$2.5 billion public works bill)
2/19/76	House overrode but Senate sustained the veto
4/13/76	Senate passed S 3201 (a \$2 billion public works bill)
5/13/76	House passed
7/6/76	Ford vetoed
7/21/76	Senate overrode the veto
7/22/76	House overrode the veto; the bill became PL 94-369 Public Works Employment Act of 1976.
10/7/76	The Public Works Appropriation Act of 1976 (PL 94-447) appropriating the \$2 billion enacted.
10/26/76	EDA accepted Round I applications
12/21/76	Round I Project Selection ended
2/24/77	House passed HR 11 (\$4 billion public works bill)
3/10/77	Senate passed
5/13/77	Carter signed the bill, making it PL 95-28, the Public Works Employment Act of 1977
5/13/77	Appropriations bill became PL 95-29, Public Works Appropriations Act of 1977
9/30/77	Round II Project Selection ended

submitted by states or local governments having unemployment rates for the three most recent consecutive months in excess of the national unemployment rate" (if that exceeds 6½ percent).⁴ Round II also requires that on-site labor must begin within ninety days and that applications must be acted upon quickly. In Round II the definition of the unemployment rate was adjusted to be defined as that applicable for the area in which the project was to be built instead of using statewide unemployment rate as in Round I. The time span for the unemployment rate under consideration was extended to the previous 12 month period. Whereas in Round I, the selection of the projects to be funded was made by EDA based upon the criteria noted above, in Round II localities that had submitted Round I applications were selected for funding. The selected localities then chose the projects, up to their funding limit, for which funding was desired. These localities were also allowed to submit additional applications and to fund these projects instead of those applied for under Round I. Regarding employment and materials requirements, Round II legislated payment of Davis-Bacon wages to subcontractors and prohibited the use of state employees on projects. Also the Round II provisions required use of materials either mined or produced in the United States. The differences between implementing the provisions of Round I and Round II are shown in Table 1-2.

Under LPW the federal government agreed to pay for up to 100% of the construction costs of the authorized projects. Money could be used for the local share of projects receiving some other type of federal support. The government would cover only the requested cost of the project. If the locality was required to contribute to a project due to some local law, the federal government would make up the remainder.

Legislative Intent

In passing the Public Works Employment Acts, Congress attempted to create jobs, provide additional economic stimulus to help the economy out of a recession and to build public infrastructure. During the debates on these two proposals there was agreement on the purpose of the legislation but some controversy surrounding the proper timing of the proposals, the magnitude of the expected impact, and the possible adverse inflationary impact of the program. Indeed, when President Ford vetoed the LPW program, his major objectives centered around the jobs inflation tradeoff. President Ford argued that "the best and most effective way to create new jobs is to pursue balanced economic policies that encourage the growth of the private sector without risking a new round of inflation."⁵

The primary objective of LPW was the creation of "new job opportunities for millions of unemployed citizens."⁶ In particular, the public works program was

⁴ Ibid., Sec. 108(c) and (d). The detail of this formula were slightly changed by the 1977 Act, but the goal of "targeting" relatively depressed regions remains unchanged.

⁵ Message from the President of the United States transmitting without my approval the Bill (S. 3201) entitled "Public Works Employment Act of 1976", July 6, 1976. Page IV.

⁶ Senator Randolph, Congressional Record, July 21, 1976, S12121.

TABLE 1-2
Provisions of Round I and Round II of the
Public Works Employment Act

Round I

Round II

FUNDING AND SET ASIDES

Authorized \$2 billion for public works projects

Added \$4 billion to the funding, thus increasing the authorization to \$6 billion through 1978.

Provides a 2½% set aside for Indian Tribes and Alaska Native Villages

Provides a \$70 million set aside for grants for projects not received, not considered or rejected as a result of an error made by an employee or official of the United States. These projects must comply with all other standards to be eligible for consideration.

ELIGIBILITY CRITERIA AND APPLICATION PROCEDURE

The application scoring procedure is as follows: 30% on the number of unemployed; 25% on the rate of unemployment; 30% on the labor intensity of the project (with maximum points given projects with labor intensities between 35% and 80%); 15% on per capital income; 5% bonus for projects' relationship to ongoing plans; 10% for long-term benefits of the project; and 5% bonus for general purpose local governments (including school districts, or 3% bonus for special districts).

The application scoring procedure is as follows: 40% of the score would be based on the rate of unemployed in the project area; 40% on the number of unemployed in the project area; 10% on the per capital income of the applicant jurisdiction, and up to 10% priority if the applicant is in a general purpose local government

The time span for the unemployment rate under consideration was the 3 months prior to the application.

Extends the time period to the previous 12 months.

Funds were to be distributed via the "70-30 split," signifying that 70% of the funds were to be given to areas with an unemployment rate above the national average and the remainder would be given to those localities with unemployment rates of equal or greater than 6.5%.

Eliminated this provision and stipulated that: (1) States and local governments submitting more than one project must list their priorities and submit this in the application; (2) States receiving the minimum funding may, with the permission of the Secretary, locate some of their projects in areas with an unemployment rate of less than 6.5% in order to

Table 1-2 (continued)

Round I

(ELIGIBILITY CRITERIA AND APPLICATION PROCEDURE)

No state shall receive less than 1% or more than 12.5% of the total funds.

States were only permitted to use state-wide per capital unemployment rates when applying for LPW funding.

Allows the Secretary to consider the unemployment rate of the neighborhood from which the labor force will be drawn.

Priority given to local governments.

Allows the Secretary to consider the unemployment rate of neighboring areas.

Round II

insure the widest distribution of funds; (3) 65% of the funds are to be allocated based on the number of unemployed and 35% based on the relative severity of unemployment (if their rate exceeds 6.5%) with 85% of funds going to high unemployment areas.

No state shall receive less than .75% or more than 12.5% of the total funds.

Allowed states to use the per capital unemployment rate for the area in which the project was to be built. This corrected the problem inherent in Round I where use of state-wide unemployment rates resulted in states receiving very little of the LPW funding.

Repeals this provision.

Gives priority to state-sponsored project if the local governments specify that this project is a priority of theirs also.

Provides that the project must be within the area whose unemployment rate is used in the project application.

The Secretary must only consider applications submitted after the enactment of the Act and on or before December 2, 1976, except for those: (1) from the trust territory of the Pacific Isles; (2) from Indian Tribes and Alaska Native Villages; (3) that arrive late if all of the allocated funds are not distributed.

Requires the Secretary to give preference to pending applications which would result in energy conservation.

Round I

Round II

(ELIGIBILITY CRITERIA AND APPLICATION PROCEDURE)

Prohibits Water Projects from consideration (those projects involving damming, dredging or diversion).

The Architectural and Transportation Barriers Compliance Board must ascertain that the projects considered will be designed in accordance with the standards of accessibility to the handicapped and elderly as provided by the Act of August 12, 1968.

Allows for the funding of drought and disaster relief projects. Monies already allocated for LPW projects can be used for drought and disaster relief projects if the new project's cost does not exceed the cost of the old project. The Secretary's permission is required for this substitution.

EMPLOYEE AND MATERIALS REQUIREMENTS

State governments are prohibited from using their own employees for the construction of the LPW project. All LPW contracts are to be distributed on the basis of competitive bidding.

Contractors must provide assurances that they will not employ illegal aliens.

Provides that Davis-Bacon wages be paid to contractors.

Extends this provision to subcontractors.

Special consideration will be given for projects which employ veterans.

At least 10% of the grant must be expended for minority business enterprises. The Secretary will determine the correct level of minority participation if the locality has a minority population of less than 5% of the total population.

The projects are to be constructed with materials mined or produced in America unless the Secretary waives this as costly or inefficient.

expected to provide jobs for construction industry workers, the need for which was viewed as particularly great. During the debate on the LPW program it was noted the unemployment rate of these workers was "approximately double the national average and in some cities approximately half of all construction workers were without jobs."⁷ The Congress was also cognizant of the indirect effect of the LPW program on the materials producing sectors of the economy. For example, it was noted that the LPW program would "also have a multiplier effect on the building materials industry, hardware retailers, forestry and lumbering occupations as well as other fields."⁸ The expected impetus in terms of job creation was expected to be less than, but comparable with, other employment programs. As Senator Gravel argued, "although the direct job creation per dollar of outlay may not be as great as in other strategies, the multiplier effect of public works may be greater than that of other job creation measures."⁹

A presumed advantage of using a program like LPW to create jobs was that it was targetable. For example Senator Humphrey said the acts would create jobs in "precisely those regions, cities and sectors of the economy that are experiencing the most severe unemployment problems."¹⁰

The construction of public infrastructure was a second objective of the legislation. Having observed recent cutbacks in state and local government expenditures, proponents of the legislation argued the nation's stock of public infrastructure was in need of replenishment. The use of an LPW type program to generate employment would therefore comprise a second goal to the extent that the funds would be used to construct community facilities badly needed by individual communities with a backlog of capital construction projects. A secondary advantage of constructing public facilities suggested by LPW proponents was that these facilities would "in turn create staffing and maintenance jobs in the locality and (that) income...(would be) generated and recycled on the local level."¹¹

The third intent of the LPW legislation was to provide an increase in Federal aid to state and local governments which, it was argued, were suffering greatly as a result of the recession. There was a recognition that high unemployment brought increased demands on local public services, at a time when receipts from taxes were declining. Also, the Congress did not want state and local government budget related actions to undermine efforts by the Federal government to stimulate the economy. The financial problems of New York City had been, of course, well publicized at the time and the Congress felt that "state and local government economic health was essential to national economic prosperity."¹²

⁷ Ibid.

⁸ Report of the Committee on Public Works, United States Senate, Public Works Employment Act of 1975. Page 2, July 21, 1975. No. 94-285.

⁹ Senator Gravel, Congressional Record, January 25, 1977. Page S1358.

¹⁰ Senator Humphrey, Congressional Record, July 21, 1976. Page S12122.

¹¹ Senator Gravel, Congressional Record, July 21, 1976. Page S12122.

¹² Public Law 94-369, Title II, Sec. 201.

Policy Issues to be Addressed

Since the primary goal of the LPW program was job creation, the net number of jobs created must be the primary criterion for evaluating the usefulness of the program. The measurement of employment is somewhat complex, since there are three distinct types of employment effects -- direct construction jobs, indirect (materials supply industry) jobs, and jobs "induced" by the multiplier effects of increase in economic activity. (A fourth potential type of employment is the continuing post-LPW jobs created due to follow-on maintenance and program needs. Employment of this type is discussed separately.)

Unfortunately not all LPW grants can be translated into direct jobs. Two mitigating factors exist in the path from expenditures to increased economic activity. These two factors are substitution and crowding out. Substitution is the use of federal funds to replace local funds on a specific project. The result of course is a reduction in the net increase in economic activity. Crowding out refers to the situation which occurs when the undertaking of a publicly financed project reduces the level of private economic activity by competing with private activities in the factor markets. Crowding out can occur either nationally or locally (or both) in response to competition in the capital, labor, and materials markets.

The timing of the employment impacts is another crucial issue for evaluation. It is important to investigate the degree to which jobs were created during the recession, so that the impact was counter-cyclical as originally envisioned. Just as important to the evaluation, however, is the extent to which the LPW program may have been too late to be counter-cyclical. Finally the degree to which an improved LPW-type program could be counter-cyclical should be addressed.

The inter-regional impacts of the local public works programs deal with the geographic distribution of the impacts of the expenditures associated with the program. The issues center around the fact that LPW is a "targetable" program. Issues such as regional economic development, equity, and the reduction of differentials in the level of unemployment all become major policy issues. Expenditure flows between regions must therefore be investigated in order to determine the final location of the economic activity generated by LPW monies.

The Role of Chase Econometric Associates, Inc.

Since both the magnitude and the nature of the impacts of a counter-cyclical public works program were far from certain, the Congress mandated that an evaluation of the LPW program be undertaken, to measure the extent to which the program did meet its legislated goals. In partial fulfillment of this mandate the Office of Budget and Program Evaluation of the Office of the Secretary, Department of Commerce contracted with Chase Econometric Associates, Inc. (CEAI) to undertake a macro-economic evaluation of the LPW program. Also being carried out under this mandate are a microeconomic evaluation of the program, undertaken by the Program Analysis Division of the Economic Development Administration, and an administrative evaluation of the program, which is also being supervised by the Office of Budget and Program Evaluation.

This report contains the procedures and results of CEAI's evaluation of the effectiveness of the LPW program as a counter-cyclical tool. As a macroeconomic evaluation, it concentrates on the impacts upon employment and economic activity at the national level. However, the evaluation also addresses questions concerning the ability of the program to meet almost all of its policy objectives, including questions concerning regional targeting, the impact upon state and local governments, and the effectiveness of the program in reducing unemployment of particular labor groups.

CHAPTER 2: METHODOLOGY

The focus of the analysis of the LPW program carried out by Chase Econometric Associates, Inc. is on the impacts that correspond to macroeconomic policy objectives. These impacts include employment generation, effects on local governments, industry impacts, inter-regional effects, and related questions such as the efficacy of LPW as a counter-cyclical program. In assessing these impacts, CEAI has used a variety of analytical techniques, including surveying and the simulation of various models of the economy. The purpose of this chapter is to outline these procedures. First, individual methodologies are discussed. Then the sequence of procedures used to analyze each of the major impacts is outlined. The result of this analysis are presented in the subsequent sections of this report.

Data and Procedures

Data

Analysis of several of the impacts required data on variables such as industrial production, unemployment, and state and local government fiscal behavior. These data are regularly published by agencies of the federal government such as the Bureau of Labor Statistics (BLS) and the Federal Reserve Board, (FRB) and thus need no more comment. In some cases, such as in the analysis of local government revenues and expenditures large amounts of unpublished government (in this case Census) data were also examined. Several sets of data, however, merit discussion because of their relative specificity and the key role they played in the analysis. These data include LPW awards data, Economic Development Administration (EDA) accounting data on actual disbursements, Commodity Transportation Survey (CTS) shipments data, BLS construction labor requirements data, and EDA LPW employment data collected on ED-746 forms.

The LPW awards data contain specific information about individual projects and jurisdictions. These data were compiled by EDA from the LPW applications and were updated according to the disposition of the application and the progress of the project. The data served as the basis for: (a) selecting CEAI's sample for surveying; (b) providing the information necessary for classifying projects for the analysis of employment and industry impacts; (c) determining expenditure patterns by jurisdiction type, region, and type of capital good; and (d) providing other useful descriptive information for all phases of the analysis.

¹ This information includes the project size (measured in dollars), the type of structure, the type of construction activity, a verbal description of the project, the name of the jurisdiction receiving the funds, the type of governmental unit, the size of the jurisdiction, and locational information about the jurisdiction and the project.

EDA accounting data were used as the basic information on the actual timing of LPW expenditures. These data record the date of the reimbursement to local jurisdictions of monies that they have spent on the LPW project. These disbursements occurred at intervals of up to three months (depending on the billing procedures to the jurisdiction), and were estimated to lag the actual expenditure by an average of about a month. The data were available only through the start of 1978.

The Commodity Transportation Survey (CTS) was carried out as part of the 1972 Census of Transportation. Based on a random sample of bills of lading from a stratified sample of manufacturing plants, the CTS provides data on shipments to each state by Transportation Commodity Classification by state of origin. The CTS provided the primary data base for estimation of inter-state and inter-regional flows of materials purchases.

Over the years the BLS has conducted several studies of the labor requirements² of various types of construction. Although some of these studies are over ten years old, when updated they still represent the best generally available data on the labor requirements of specific type of construction. In some form or other they serve as the primary input for most efforts to estimate the employment generated by construction projects. Each year the BLS updates these estimates based upon changes in labor productivity and the price of each type of structure. The results, in terms of person-hours and person years per unit of expenditure, are available from the BLS in unpublished form. These labor requirements coefficients³ were used to estimate construction industry and indirect employment impacts of the LPW program.

As part of the evaluation of Round I of the LPW program, EDA has been collecting payroll data from contractors and subcontractors on actual employment. These represent the only primary data on LPW employment. These data, however, were not available in time to be included in the analysis presented in this report.

² Labor requirements coefficients are given for both the construction industry (direct employment) and other industries (indirect employment). Construction industry requirements are further divided into onsite and offsite. Other industries are divided into manufacturing; trade, transportation and services; and mining and all other.

³ The construction categories that were relevant to LPW are private multi-family housing, private single-family housing, general hospitals, elementary and secondary schools, federally aided highways, sewer works (lines), sewer works (plants), civil works (land), public housing, and federal office buildings. A coefficient for direct labor requirements in utilities construction was developed from data on cost and labor requirements per kw of capacity in a joint DOL/DOE report on labor and capital requirements for electric power plants. Less than 4 percent of employment was generated by this type of construction, however, so BLS will hereafter be referred to exclusively as the source of these labor requirements coefficients.

Surveys

A major portion of the research involved the conducting of two surveys, one of local government officials in recipient jurisdictions, the other of LPW project contractors. Since the intention of the Department of Commerce is to follow-up these surveys with a more extensive data gathering effort designed to evaluate the LPW program from a microeconomic viewpoint, the size of the survey was limited to less than the number of observations which would be sufficient to allow stratification for rigorous statistical analysis. Nevertheless the surveys were large enough to cover a wide range of localities, project types, regions and contractors. The results of this effort showed some fairly clear patterns and provided information that was extremely useful in many areas of the research.

The primary survey was a survey of officials of 50 local jurisdictions receiving LPW funds. These jurisdictions were chosen to be representative with respect to the population universe of type of governmental unit, population of LPW recipients, total LPW awards to individual jurisdictions, number of LPW projects received, and regional distribution of LPW funds.⁴ The sample is presented in Table 2-1.

The survey contained two parts, a written questionnaire and an orally administered questionnaire. The written questionnaire dealt primarily with current and recent budget and financial management. One written questionnaire was sent to each jurisdiction. The oral questionnaire covered a range of topics, including capital budgets and financial planning, general economic conditions, the decision making process that led to LPW applications, actual and potential local funding for both LPW-funded and rejected projects, potential difficulties with contractors, and community attitudes toward the LPW project. Some of these questions were designed to elicit perceptual (rather than necessarily factual) responses. In each jurisdiction a range of officials was interviewed, including (where possible) the LPW coordinator, policy makers, financial officials, and elected officials.

⁴ Survey sites were restricted to counties, cities, and school districts. Other types of jurisdictions are to heterogeneous and few in number to provide meaningfully interpretable results in a survey of this size. Cities receiving large amounts of LPW funding and large numbers of LPW projects were sampled at two to three times the proportions appearing in the population. Two-thirds of the sample jurisdictions were located in SMSAs, so as to over-sample urban jurisdictions.

TABLE 2-1

Local Public Works Sample

Locality	Region	Type	EDA Obligation (\$1000)	Population (1000)	SMSA	Number of Projects
1. Alton, IL	Great Lakes	E	912	40	Yes	2
2. Bedford Co., TN	Mid South Atlantic	D	154	12	No	1
3. Bethlehem, Pa	North Atlantic	F	55	73	Yes	1
4. Brewton, AL	South Atlantic	E	80	7	No	1
5. Chicago, IL	Great Lakes	F	3,570	3,367	Yes	5
6. Cleveland, OH	Great Lakes	E	8,979	660	Yes	4
7. Collier Co., FL	South Atlantic	D	643	18	No	3
8. Connellville, PA	North Atlantic	E	257	11	No	3
9. Deland, FL	South Atlantic	E	535	14	Yes	1
10. Detroit, MI	Great Lakes	E	46,200	1,355	Yes	17
11. Durham, NC	Mid South Atlantic	F	144	133	Yes	1
12. Elkins, WV	North Atlantic	E	565	8	No	2
13. Erie, PA	North Atlantic	E	2,435	129	Yes	5
14. Evanston, IL	Great Lakes	E	827	76	Yes	2
15. Fairfield, CT	North Atlantic	E	776	55	Yes	1
16. Great Falls, MT	North Pacific	E	400	60	Yes	2
17. Greenbelt, MD	North Atlantic	E	282	18	Yes	1
18. Henderson, NV	Southwest	E	1,469	20	Yes	5
19. Iron Co., MO	Great Lakes	D	131	1	No	1
20. Kingman, Az	Southwest	E	832	7	No	1
21. Mars, PA	North Atlantic	E	109	1	No	1
22. Milwaukee, WI	Great Lakes	E	12,959	685	Yes	10
23. Muskogee, OK	Southwest	E	160	40	No	1
24. Nashua, NH	North Atlantic	E	6,159	62	Yes	5
25. Passaic Co., NJ	North Atlantic	D	2,070	136	Yes	3

TABLE 2-1 (Continued)

Locality	Region	Type	EDA Obligation (\$1000)	Population (1000)	SMMA	Number of Projects
26. Philadelphia, PA	North Atlantic	E	51,175	1,949	Yes	35
27. Portland, OR	Southwest	E	9,738	363	Yes	9
28. Providence, RI	North Atlantic	E	11,910	163	Yes	4
29. Renton, WA	North Pacific	F	826	24	Yes	3
30. Roanoke, VA	North Atlantic	E	1,962	91	Yes	5
31. Rome, NY	North Atlantic	E	1,544	50	Yes	4
32. Roy, UT	Midwest	E	123	17	Yes	1
33. Salem, VA	North Atlantic	E	439	25	No	2
34. San Antonio, TX	Southwest	E	5,547	758	Yes	4
35. San Diego, CA	Southwest	E	14,471	765	Yes	8
36. Saratoga, CA	Southwest	F	330	30	Yes	1
37. Savannah, GA	South Atlantic	F	255	106	Yes	1
38. Seaford, DE	North Atlantic	E	795	5	No	3
39. Sedalia, MO	Great Lakes	F	735	23	No	2
40. Sequin, TX	Southwest	E	250	16	Yes	1
41. Silver City, NM	Southwest	E	428	8	No	1
42. Slidell, LA	South Atlantic	E	830	20	Yes	1
43. South Bend, IN	Great Lakes	E	528	118	Yes	2
44. Springfield, KY	Great Lakes	E	451	3	No	2
45. Springfield, MA	North Atlantic	E	5,391	158	Yes	3
46. Tucson, AZ	Southwest	F	100	263	Yes	1
47. Uinta Co., WY	Midwest	D	249	4	No	2
48. Vernon, CT	North Atlantic	E	1,126	29	Yes	1
49. Watervliet, NY	North Atlantic	E	199	12	Yes	1
50. Worcester Co., MA	North Atlantic	D	193	172	Yes	1

CODE

D = County

E = City

F = School District

The survey of local government officials served many purposes. The most important of these was to provide data for measuring and analyzing the amount of funding substitution. Survey results were also used in the analyses of inter-regional flows of labor, crowding out,⁵ and several other specific issues. Moreover, the survey generally provided a background familiarity with the workings of the LPW program at the local level.

The second survey covered 27 contractors, all of whom were working on projects included in the survey of local government officials. This questionnaire was administered orally to the contractor or official of the contracting firm. It included questions on the employment generated by the LPW job, employment alternatives, sources of labor and materials supply, and any recent or potential changes in use of materials, labor or technology. This last line of questions was designed to determine the possible need for updating non-current input/output tables for analysis of industry impacts. (No need was found.) The other primary area of application was in estimating possible inter-state and inter-regional flows of labor and contractors. The results of this survey were also used in the analysis of crowding out and of employment impacts. Although the sample was too small for statistical rigor, the uniformity of many of the results of this survey suggests that they can be used with considerable confidence in addressing a number of important--if limited--questions.

Econometric Models

Econometric models were used as an integral part of the analysis in many parts of the research. Two models used particularly heavily were the CEAI Macroeconomic Model and the Chase/INFORUM input/output Model.

The effects of the LPW program on the economy as a whole were estimated by a simulation of the CEAI Macroeconomic Model.⁶ First, a baseline simulation was run using actual historical values of variables through 1978.2 and CEAI standard forecast values from 1978.3 to 1980.4 of all variables. Second, a policy impact simulation was prepared deducting LPW expenditures⁷ from this baseline. The

⁵ The analysis of crowding out was supplemented by telephone interviews with officials from 7 extremely isolated jurisdictions receiving over \$2,000,000 in LPW funds. These officials were asked questions pertaining to the impact on the local economy and the sources of contractors, labor, and materials.

⁶ The CEAI Macroeconomic Model is a regression-based model of the United States economy. It analyses the consequences of economic and political events on approximately 350 economic indicators ten quarters into the future (ten years, on an annual basis). The data base is continually updated, and the forecasts are updated each month to reflect revisions in the data and changes in the economic environment.

⁷ LPW expenditures, by quarter, were subtracted from federal grants-in-aid to state and local governments. State and local expenditures were reduced by the amount of LPW expenditure net of estimated substitution. Direct materials supply industry impacts estimated from the Chase/INFORUM Model were also deducted, since state and local construction does not presently impact the materials supply industries in the CEAI Macroeconomic Model.

difference in results was attributed to the LPW program. This procedure was used to obtain estimates of construction industry employment, total employment, crowding out, and spillover effects. Another set of simulations was run to evaluate the effects the LPW program would have had, had it been initiated in the second quarter of 1974 -- 90 days after the earliest possible identification of the latest recession.

The Chase/INFORUM Model⁸ was used in several contexts to determine the impact of the LPW program on materials supply industries. The first step in this application was to classify the LPW projects into two dozen construction categories. From the input/output inverse coefficients the materials requirements of expenditure on each type of construction were determined. Labor requirements to produce these materials were also determined, based on measures of productivity. By this means estimates of the indirect employment effects were derived. The direct input/output coefficients were also used to provide estimates of the direct materials requirements to estimate the first round materials flows between states. The INFORUM Model was also used in assessing industry impacts in the LPW program.

Analysis of Major Issues

Timing of Expenditure

Underlying the analysis of both the timing of impacts of the LPW program and the size of the impact at any point in time is the pattern of LPW expenditures over time. EDA accounting data on disbursements were used to measure this. Unfortunately, however, these data were only available through very early 1978. Thus the expenditure for 1978 and beyond had to be predicted.

The first step was to determine the time pattern of expenditure on completed Round I projects.⁹ For each project, disbursements were smoothed to a stream of daily expenditures⁹ and then aggregated to monthly expenditures and seasonally adjusted. These expenditures were dated one month earlier than the disbursements to allow for a lag in filing for reimbursement. The percent completion of each project was then calculated¹⁰, and a subset containing all completed Round I

⁸ The Chase/INFORUM Model is a version of the University of Maryland's inter-industry forecasting model which uses a combination of input/output analysis and econometric modeling to determine annual industry outputs based on forecasts for all product markets. It is design linked to the CEAL macroeconomic model and provides projections of the activity levels of 200 industries and detailed forecasts of industrial output and employment.

⁹ Each disbursement was assumed to have been spent in equal daily amounts over the period since the previous disbursement. For the first disbursement, the expenditure was allocated evenly over the previous month.

¹⁰ The percent completion was measured by the ratio of the cumulative total of disbursements to EDA obligations for the project.

projects was selected.¹¹ Next the projects were divided into five size classes.¹² Classifications based on the type of construction were also explored, but no significant or consistent differences in the timing of expenditures were found with respect to the size adjusted types of construction.¹³ For each size class, a monthly cumulative percent of expenditure was then computed. Finally, values were interpolated to produce a function of cumulative percent of expenditure relative to cumulative percent of time for the projects completed in the period covered by the data. Figure 2-1 shows the graph of this function for the smallest size class. The non-linear pattern of expenditure reflects three factors:

- Expenditure on a given project is highest in the middle of the period because of gradual start-up at the beginning and phasing out at the end of a project.
- Differences in the time of initiation of individual projects cause the aggregate level of expenditure to rise initially over a period of months.
- Different lengths of time required to complete each project cause aggregate expenditures to fall during the latter half of the period.

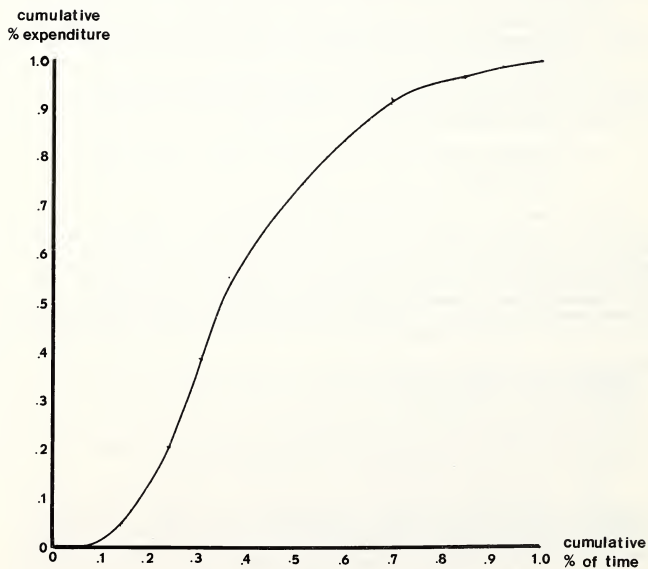
The next step was to predict the timing of future LPW expenditures, based on the actual timing of expenditures on completed projects. In making these projections it was assumed that the time pattern of expenditures -- in terms of percent of expenditures relative to percent of time -- would be the same for all projects as it was for completed projects. The percent of expenditures on all Round I projects through December 1977 was calculated for each size class. Next the corresponding percentage of time that the first twelve months represented for that size class of Round I projects was derived from the percentage expenditure/time

¹¹ Completed projects were defined as those for which 99 to 101 percent of obligated funds had been spent.

¹² The size classes were \$1 to \$199,999; \$200,000 to \$499,999; \$500,000 to \$999,999; \$1,000,000 to \$2,999,999; and \$3,000,000 and over.

¹³ There were eight distinct construction categories with a share of LPW funds over about 4 percent. Upon visual inspection of graphs of expenditure (month-by-month, or cumulative), it was apparent that only two or three of these differed from the average timing pattern. When standard deviations of the quarterly cumulative percentages of expenditure were calculated, the standard deviation within each construction category was found to be at least twice the size of the difference between means of construction categories.

FIGURE 2-1
TIME PROFILE OF LPW EXPENDITURES
(\$0-199,999 SIZE CLASS)



function described above.¹⁴ Based on this percentage, the total time (in months) for completion of the size class as a whole was calculated.¹⁵ Finally monthly expenditures for the size class were derived from the percentage expenditure/time function.¹⁶ The results were summed over size classes for each month and aggregated on a quarterly and annual basis.

For Round II expenditures only four months of data existed, which was not enough to obtain any independent estimate of timing. Moreover CEAI's survey experience suggested that the exceptionally hard winter had substantially delayed initiation of many projects. Aggregate state and local construction data, however, suggested a boom in the second quarter of 1978. Thus Round II expenditures were predicted in the following manner: For the first quarter of Round II (October-December 1977) historical data were used. For the next quarter expenditures were assumed to have maintained the December 1977 level. For the third quarter the cumulative shortfall from the first six months of the Round I pattern was added to the expenditures for each class. Beginning with the tenth month (July 1978), each class of Round expenditure of each size class was assumed to follow the same pattern (in percentage terms) as Round I expenditure.

As in the case of Round I, the monthly percentages of expenditure were multiplied by size class expenditure totals, summed across size classes, and aggregated to quarterly and annual values.

¹⁴ There were not enough completed projects in the largest three size classes to calculate stable functions relating percentage expenditure to percentage time. Thus the time pattern for the second smallest size class adjusted for the size of the projects was used for these size classes.

¹⁵ This computation of the total time required for completion is equivalent to solving for "Months to completion" in the formula:

$$\frac{\text{Expenditure through December 1977}}{\text{Total Obligations}} = \frac{12}{\text{Months to Completion}}$$

where December 1977 is the 12th month of the project. The estimated number of months to complete the five size classes of projects (smallest to largest) were 19, 20, 23, 28, and 36, respectively.

¹⁶ Through December 1977 actual expenditure data were used. For subsequent months, the time through that month was taken as a percentage of total months, the corresponding cumulative percent of expenditure was determined from the function, and the cumulative percent of expenditure for the previous month was subtracted from this total. The remainder was then multiplied by total expenditure for the size class.

Expenditures for Round I, Round II, and the LPW program as a whole are shown in Table 2-2 on a quarterly basis and in Figure 2-2 on a monthly basis. These expenditures streams form the basis of the analysis of employment creation over time (Chapter 4), Industry impact over time (Chapter 5), and evaluation of LPW as a counter-cyclical policy (Chapter 8).

Estimation of Employment Impacts

Construction industry expenditures create employment at three levels: Direct employment (in the construction industry itself), indirect employment (employment in the materials supply industries and other related employment), and induced employment (non-specific employment brought about by a higher level of aggregated demand). CEAI used several approaches in estimating these impacts, including the application of BLS labor requirements coefficients, input/output table coefficients, and macroeconomic simulation. This section deals with these methodologies. Actual results are discussed in Chapter 4 and are presented in summary form in Tables 4-1 and 4-2.

Both direct employment and indirect employment were estimated from BLS labor requirements. The first step in this analysis was to classify the LPW projects by BLS construction categories. In most cases this was done on the basis of the structure codes contained in the awards data, although the activity codes were also determining factors for some types of projects. Several miscellaneous structure types also had to be classified by project description. The exact classification of work-type codes is shown in Appendix A. Projects in each construction category were then disaggregated by round and size class, and quarterly expenditures were computed for each size class. Expenditures were reaggregated by quarter over the ten round/size classes for each construction category.¹⁷

Once the expenditure streams for each construction category were determined, the expenditures could be multiplied by the corresponding employment requirements coefficients. Here, however, a problem arose because the LPW expenditures were spread over more than three years. During this time significant changes in prices and productivity could be expected to take place.¹⁸ The BLS makes these adjustments using a variety of price and productivity indices, but they are not available on a forecast basis. CEAI therefore assumed that the percentage change in the BLS labor requirements between 1976 and 1977 will also occur between 1977 and 1979, and 1979 and 1980. These adjusted coefficients are shown in Appendix A.

These adjusted annual labor requirements coefficients were then multiplied by the corresponding quarterly construction category expenditure streams to produce quarterly employment estimates. This process was done both for the BLS construction industry labor requirements and the BLS "other industry" labor requirements to

¹⁷ Quarterly expenditures were computed by multiplying the round/size class expenditure by the percent of round/size class expenditure measured or estimated for that quarter, as described above. The disaggregation was made necessary by variation among construction categories of the proportions of expenditure in each round and size class.

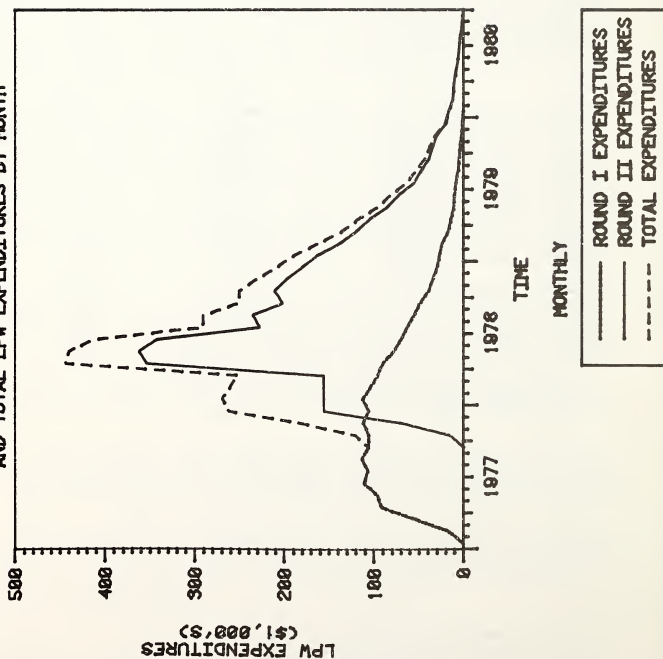
¹⁸ Both price and productivity increases will decrease the employment generated per dollar. Price increases will mean that more dollars are required to build a given structure; productivity increases will mean fewer person-hours are required. Because of these factors, the BLS estimates of labor requirements per dollar fell by an average of over 12 percent between 1976 and 1977.

TABLE 2-2
QUARTERLY LPW EXPENDITURES
(\$1000s)

<u>Quarter</u>	<u>Round I</u>	<u>Round II</u>	<u>Total</u>
1977.1	72,864		72,864
1977.2	200,422		200,422
1977.3	326,462	737	327,199
1977.4	323,299	240,393	563,692
1978.1	311,784	469,114	780,898
1978.2	237,330	1,058,427	1,295,758
1978.3	167,328	664,809	832,137
1978.4	102,157	587,779	689,936
1979.1	66,219	418,172	484,391
1979.2	34,425	259,862	294,287
1979.3	18,709	142,431	161,140
1979.4	6,431	83,128	89,559
1980.1		38,866	38,866
1980.2		20,507	20,507
1980.3		7,049	7,049

FIGURE 2-2

ROUND I ROUND II
AND TOTAL LPW EXPENDITURES BY MONTH



produce, respectively, estimates of direct and indirect employment. This direct employment estimate was incorporated into CEAI's results. The indirect employment estimate was supplemented by the following procedure.

Indirect employment effects were also measured using the Chase/INFORUM (input/output) Model. The procedure was quite similar to that used with the BLS labor requirements coefficients, but it was more complex because there are about twice as many relevant input/output construction categories as BLS categories. First the projects were classified into input/output categories, based upon structure codes, activity codes, and project descriptions. The exact classifications are shown in Appendix A. Next the expenditure stream was computed by round/size class for each input/output category and aggregated over the round/size classes annually. During this process some adjustments were made for variations in timing of use for some of the major materials.¹⁹ The result of this process was a stream of annual expenditures for each input/output category.

20

The coefficients used were the inverse requirements coefficients of the Chase/INFORUM Model, aggregated to 57 sectors. The labor requirements of each of these sectors were adjusted to an annual basis for predicted productivity and

¹⁹ Estimates of these variations were obtained through conversations with trade associations which were familiar with the stage of construction requirements of different types of construction.

²⁰ The direct coefficients in an input/output table measure the labor and materials inputs required to produce a given material. The inverse requirements matrix, measures the materials requirements at the first and all previous stages of production.

Like other input/output coefficients, these coefficients represent average labor requirements. It is arguable that marginal labor requirements should be used for analysis of individual programs. (See, for example, Georges Vernez, et. al., *Regional Cycles and Employment Effects of Public Works Investment*. R-20520-EDA (Santa Monica: Rand, 1977.)) It is doubtful, however, whether marginal labor requirements can be estimated of marginal labor productivity (which is the reciprocal of labor requirements) range from negative values to more than 40 times as large as average productivity. Many of these values are not even remotely plausible. Moreover it is doubtful that marginal labor requirements differ much from average requirements in this case. As a long run proposition at least, the marginal cost of production has generally found to be constant -- and equal to average cost -- in the relevant range. The issue thus becomes one of short-run fluctuations. Yet cyclic changes in manufacturing productivity have usually been observed to be quite small, even on a quarterly basis. Even during the period 1973.4-1975.4, the period of the worst post-war recession, productivity fell only slightly below the trend line maintained in subsequent expansionary periods. If there were large changes in the marginal productivity of labor, inventories could (and would) be used to equalize the value of output per employee. Furthermore, one would expect substantially larger cyclic variations in pricing policies than are commonly observed. Finally, even if marginal labor productivity (and requirements) differed from average in booms and recessions, the LPW program is occurring during a period which might well be described as one of "average" economic activity. Output is well above recession levels, but below the level at which shortage would be a danger. Thus even if cyclical fluctuations were important, the economy is in an intermediate situation where marginal productivity can be expected to be close to average productivity.

price changes, using CEAI forecast values. Each sector of industry labor requirements was then multiplied by the stream of expenditures for the corresponding input/output construction category. The results of this operation were summed over industries and over input/output construction categories to obtain annual employment estimates. For comparability with other quarterly estimates a quarterly employment series was generated by allocating the annual employment creation to the quarters in the same proportion as estimated LPW-generated expenditure on materials. CEAI judges these results to be more accurate than the BLS based indirect employment estimates, because of the greater detail of the Chase/INFORUM Model and availability of forecast adjustments.

CEAI also used its Macroeconomic Model to forecast LPW employment. This simulation utilized the estimated quarterly stream of net LPW expenditures and of expenditures on materials. The output of the simulation included quarterly employment impacts in the construction industry (direct) and on the economy as a whole (the sum of direct, indirect, and induced). In addition, the simulation showed some negative effects on expenditure in the residential and non-residential construction sectors. These were interpreted as crowding out effects, and were converted to employment estimates using the adjusted BLS labor requirements coefficients.

Simulation of econometric models is the only available technique for the estimation of total employment. Unfortunately the results are not directly comparable with labor requirements coefficients results. The labor coefficient technique produces results in terms of person-hours or person-year equivalents. The macroeconomic simulation results are in terms of the number of people who are "employed." Since most construction work was extremely short-term,²¹ much of this work may have been done by people who were already "employed." This portion of the effect would not tend to be counted in the simulation results. To overcome this difficulty, the simulation results were transformed into an employment multiplier.²² The employment multiplier was used to expand the direct employment estimates²³ based on labor requirements in order to produce an estimate of total employment that was comparable with the BLS-based or INFORUM-based estimates of direct and indirect employment.

²¹ EDA estimates of PWIP employment suggest that the average job is slightly less than a month in duration. Preliminary ED-746 results confirm this estimate.

²² The employment multiplier is defined as the ratio of total labor required to labor required in direct employment.

²³ In estimating total employment, CEAI actually multiplied the employment multiplier by the average of estimated direct and indirect employment, which were approximately equal overall. This was done to reflect differences in timing of the two types of employment rather than simply to project the timing pattern of direct employment.

Estimation of Impacts Upon Governments

The analysis of impacts upon local governments involved two major issues. The first of these was the definition and identification of the trend and cyclic positions of state and local governments (including the effects of economic conditions on local governments and their responses to them, the degree of locality distress, and differences among types of localities). The second was an analysis of the importance of LPW expenditures relative to this cyclic position. The procedure used was generally interpretive analysis and comparison of data series, although some econometric estimation was also used. Findings on these issues are discussed in Chapter 5.

Both the concept of "trend" and of "cyclic position" are inherently judgmental. However, efforts were made to date and to suggest the importance of both factors. The concept of cyclic position used in the analysis was the effect that general economic conditions have on the state and local fiscal situation.²⁴ Locality trend was estimated based upon expenditure and tax burden²⁵ data. Exploring the impact of cyclic conditions on localities and the localities' responses was of course more complex, and many time series were examined and interpreted, including:

- State and local government expenditures
- State and local government capital expenditures, by type of structure
- State and local taxes
- State and local surpluses
- State and local bond interest rates, both absolute and relative²⁶

²⁴ Virtually all of the available literature is concerned with the opposite issue -- the effect of state and local net expenditure on the economy as a whole.

²⁵ The measure used was a ratio of state and local taxes to the sum of personal income, minus total federal personal taxes, minus transfer payments.

²⁶ Specific measures included:

- The ratio of composite state and local interest rates to federal bond interest rates
- The ratio of state and local interest rates to composite corporate bond rates
- The ratio of municipal bond interest rates to Moody's AAA corporate bond rates

- Proxies for property tax rates²⁷
- A measure of state and local tax burden
- Construction activity

These series were analyzed for trends and cyclical movements. Significant turning points were compared with NBER reference cycles. Trends were compared with information on demographic and political developments over the last two decades. The relationship among the different variables themselves, of course, was a key focus of the analysis.²⁸ The insights gained from this analysis were consolidated into a hypothesis about the timing and flexibility of response of localities to general economic conditions and a regression equation to predict state and local government construction expenditures.

Further analysis was then carried out on individual classes of government. Measures of their fiscal situation -- including interest rates, bond rating classes, debt load, surplus, and welfare expenditures -- were examined and compared to establish relative needs for counter-cyclical assistance or these classes of government.

The analysis concluded with a comparison of LPW expenditure with state and local government spending. First LPW expenditures were compared with capital budgets²⁹ by locality class. These comparisons were related to the relative need of locality classes. Next projections were made of state and local capital expenditure adjustments during the LPW period based upon the decline from the 1974 local maximum. LPW expenditures were then compared to these adjustments.

²⁶ • The ratio of state and local BAA bond rates relative to state and local AAA bond rates

The first two of these measures were designed to show the fiscal tightness of state and local governments relative to other sectors of the economy. The last two measures were designed to reflect the risk factor in state and local government finances.

²⁷ The measures used were ratios of property tax receipts per house to the mean value of new houses, and to the median value of new houses.

²⁸ Some of the variables, taken individually, had ambiguous interpretations. A declining surplus, for example, could reflect an uncontrollable recessionary reduction of taxes and resultant tightening fiscal situation, or it could reflect intentional increases of expenditures due to a comfortably recovering fiscal situation.

²⁹ Estimates of construction budgets were used as an alternate measure.

For this analysis, considerable difficulty was encountered simply defining state and local capital budgets.³⁰ The problem extends far beyond differing accounting procedures. Formal procedures for allocating and transferring funds differ widely, as do the relationships between different funds in the budgets and the treatment of non-local funds. The differences between informal *ad hoc* procedures and formal ones is perhaps even more important. As a result CEAI used two concepts of capital budget: The first was Bureau of the Census definitions, which are comparable to National Income and Product Accounts concepts. The second was CEAI survey responses, which reflect locality perceptions of capital budgets.

Estimation of Industry Impacts

Assessment of industry impacts involved four basic stages. First the affected industries were identified. Next their cyclic positions and distress were analyzed. Third, the impacts of LPW expenditures on these industries were calculated. Finally, the impacts were compared with the state of the industry at the time of the LPW program. For the most part the analysis involved applying the data bases employed with, and the relationships embodied in, the Chase/INFORUM and CEAI short term industry models. Simulations of the economy were also used. Results are discussed in Chapter 5.

Identification of affected industries was done using the Chase/INFORUM (input/output) model. This model was aggregated to 57³¹ supplying industries, which generally correspond to the 3-digit, and often the 4-digit SIC code level of detail. Construction was disaggregated into 24 types, using Bureau of Economic Analysis (BEA) categories. The industries, construction categories, and direct requirements coefficients are shown in Table 2-3.

Analysis of the cyclic position and distress of industries entailed evaluation of both the cycles themselves and their relation to the NBER reference cycles. The period of analysis was 1957-1977. Analysis was carried out for two dozen major industries on the 2-digit and 3-digit level of detail. Industrial production indices were used to reflect the status of the industry. The data used included:

- Peak and trough values
- Peak and trough lags behind NBER reference cycle turning points
- Percent changes from peak to trough and trough to peak
- Trend growth rates

³⁰ The concept of discretionary capital budget proved to be unquantifiable by any means other than judgmental assumptions.

³¹ The exact number of industries varies from procedure to procedure. This is partly due to the fact that some industries are not sufficiently important to be of interest for certain analyses. It also reflects differences between the definitions of industries in the input/output classifications (used in INFORUM) and FRB industrial production indices.

Table 2-3 DIRECT AND INDIRECT MATERIAL REQUIREMENTS PER DOLLAR OF CONSTRUCTION (Producer Prices)

CONSTRUCTION CATEGORIES										INDIRECT MATERIAL REQUIREMENTS PER DOLLAR OF CONSTRUCTION									
</																			

TABLE 2-3 DIRECT AND INDIRECT MATERIAL REQUIREMENTS PER DOLLAR OF CONSTRUCTION (Producer Prices)

CONSTRUCTION CATEGORIES - MILLIUS	FACILITIES	MANUFACTURE	OTHER - MILLIUS	FAVOR CONSTRUCTION UTILITIES LABOR RAILROADS CONSUME TELEPHONE-TELE
1. BASIC METAL	0.00106	0.00101	0.00106	0.0
2. BASIC SEAMS	0.00125	0.00110	0.0	0.00068
3. STEEL-CLAY MIX	0.00130	0.00104	0.00010	0.00016
4. STEEL-CLAY MIX	0.00130	0.00104	0.00010	0.00016
5. FLOOR FURNITURE	0.0	0.0	0.0	0.0
6. FLOOR COVER	0.00070	0.00060	0.00028	0.0
7. UTM. TRAIL APP	0.00052	0.00067	0.00029	0.0
8. FLOOR COVER	0.00052	0.00067	0.00029	0.0
9. FLOOR COVER	0.00052	0.00067	0.00029	0.0
10. MILL-CLAY MIX	0.00074	0.00054	0.00023	0.00029
11. FURNITURE	0.00052	0.00067	0.00029	0.00029
12. FURNITURE	0.00052	0.00067	0.00029	0.00029
13. FURNITURE	0.00052	0.00067	0.00029	0.00029
14. UTM. CEMENT	0.00052	0.00067	0.00029	0.00029
15. FURNITURE	0.00052	0.00067	0.00029	0.00029
16. FURNITURE	0.00052	0.00067	0.00029	0.00029
17. FURNITURE	0.00052	0.00067	0.00029	0.00029
18. FURNITURE	0.00052	0.00067	0.00029	0.00029
19. FURNITURE	0.00052	0.00067	0.00029	0.00029
20. FURNITURE	0.00052	0.00067	0.00029	0.00029
21. FURNITURE	0.00052	0.00067	0.00029	0.00029
22. FURNITURE	0.00052	0.00067	0.00029	0.00029
23. FURNITURE	0.00052	0.00067	0.00029	0.00029
24. FURNITURE	0.00052	0.00067	0.00029	0.00029
25. FURNITURE	0.00052	0.00067	0.00029	0.00029
26. FURNITURE	0.00052	0.00067	0.00029	0.00029
27. FURNITURE	0.00052	0.00067	0.00029	0.00029
28. FURNITURE	0.00052	0.00067	0.00029	0.00029
29. FURNITURE	0.00052	0.00067	0.00029	0.00029
30. FURNITURE	0.00052	0.00067	0.00029	0.00029
31. FURNITURE	0.00052	0.00067	0.00029	0.00029
32. FURNITURE	0.00052	0.00067	0.00029	0.00029
33. FURNITURE	0.00052	0.00067	0.00029	0.00029
34. FURNITURE	0.00052	0.00067	0.00029	0.00029
35. FURNITURE	0.00052	0.00067	0.00029	0.00029
36. FURNITURE	0.00052	0.00067	0.00029	0.00029
37. FURNITURE	0.00052	0.00067	0.00029	0.00029
38. FURNITURE	0.00052	0.00067	0.00029	0.00029
39. FURNITURE	0.00052	0.00067	0.00029	0.00029
40. FURNITURE	0.00052	0.00067	0.00029	0.00029
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42. FURNITURE	0.00052	0.00067	0.00029	0.00029
43. FURNITURE	0.00052	0.00067	0.00029	0.00029
44. FURNITURE	0.00052	0.00067	0.00029	0.00029
45. FURNITURE	0.00052	0.00067	0.00029	0.00029
46. FURNITURE	0.00052	0.00067	0.00029	0.00029
47. FURNITURE	0.00052	0.00067	0.00029	0.00029
48. FURNITURE	0.00052	0.00067	0.00029	0.00029
49. FURNITURE	0.00052	0.00067	0.00029	0.00029
50. FURNITURE	0.00052	0.00067	0.00029	0.00029
51. FURNITURE	0.00052	0.00067	0.00029	0.00029
52. FURNITURE	0.00052	0.00067	0.00029	0.00029
53. FURNITURE	0.00052	0.00067	0.00029	0.00029
54. FURNITURE	0.00052	0.00067	0.00029	0.00029
55. FURNITURE	0.00052	0.00067	0.00029	0.00029
56. FURNITURE	0.00052	0.00067	0.00029	0.00029
57. FURNITURE	0.00052	0.00067	0.00029	0.00029
58. FURNITURE	0.00052	0.00067	0.00029	0.00029
59. FURNITURE	0.00052	0.00067	0.00029	0.00029
60. FURNITURE	0.00052	0.00067	0.00029	0.00029

Cyclical characteristics of different industries were compared, and the stability of the cycle of each industry over the entire study period was evaluated. The share of output of each industry whose output is used in construction -- and thus the potential for a program such as LPW to assist the industry -- was also analyzed. A measure of industry distress was defined as the percentage decline of the production index from peak to trough during a recession.³² Finally, in order to establish further the "normal" pattern of recovery, the CEAI Macroeconomic and Industry Models were simulated for the 1970 and 1974 recessions under the assumption that federal counter-cyclic monetary and fiscal policy had not taken place.³³

Impacts of LPW expenditures on industries were traced by applying data and projections on expenditure to the Chase/INFORUM Model. CEAI's estimated quarterly expenditure streams, disaggregated by type of construction and adjusted for time phasing of major inputs, were multiplied times the Chase/INFORUM total requirements coefficients.³⁴ The results of this procedure were summed by quarter and industry to produce a quarterly stream of value of shipments, in constant dollars, for each industry.

Comparison of LPW impacts with the state of the industry involved three procedures. First the impact of LPW in 1978³⁵ was computed as a percent of the previously derived measure of industry distress (percent decline of the production index from the 1973-74 peak to the following trough). Next the value and movement of each production index in 1977-78 was compared to the previous peak. Finally a computation was made of the amount of LPW expenditure that would have been required to produce a 20 percent reduction in distress for each industry. These results were then analyzed to determine the efficacy of the amount and timing of LPW expenditures in relieving industry distress.

³² Rates of return were also explored as a measure of distress. They were found to be of very limited value, however, because the firms for which data are available are typically active in several industries.

³³ Because of the mixed motives behind most fiscal measures, the identification of "counter-cyclical" policy measures is necessarily based on informed judgment. The specific modifications used are: For 1970. The phase-out of the income tax surcharge was revised, as the Phase II (1971) personal tax cut. The investment tax credit was not re-instituted. A steady 4% growth in the non-borrowed monetary base less currency was assumed. For 1975. The March tax reduction act affecting 1975 and 1976 was eliminated. Transfer payments to persons in 1975 and 1976 were reduced by approximately \$4.5 billion. Grants-in-aid were reduced by an amount which grew steadily from \$5 billion to \$18 billion, with 50% of the change being reflected in state and local expenditures. Federal direct purchases in 1976 were reduced by \$3 billion. A steady 7.5% growth in the non-borrowed monetary base less currency was assumed.

³⁴ These coefficients include both direct requirements of construction and requirements of earlier stages of production.

³⁵ This represents the maximum level of impact of LPW, since over 60 percent of expenditures took place in 1978.

Estimation of Inter-Regional Impacts

An assessment of inter-regional flows of expenditures were carried out to determine the effects that materials purchases had in altering the regional distribution of LPW impacts and to gain insights into the feasibility of geographical targeting of expenditures. First, a suitable set of regions was defined based upon economic homogeneity. Next the flows between states and regions were estimated. Finally these flows were analyzed to determine the net regional impact of LPW expenditures. A variety of techniques was used, including correlation analysis, input/output analysis, and the compilation of survey information. Findings are discussed in Chapter 7.

As a preliminary step to defining the regions, the Census regions were analyzed for cyclic homogeneity. Variables were devised to measure cyclic timing,³⁶ severity,³⁷ duration,³⁸ and volatility³⁹ of unemployment in the component states of each region. Statistical tests were made for the 1971 and 1974 recessions to determine if there were significant differences between regions for these variables. Few cases of significant difference were found. The degree of correlation of these variables from recession to recession for individual states was also computed and found to be low. It was therefore concluded that neither the Census regions nor individual states provided a particularly useful definition of regions for evaluation of a counter-cyclical program.

In defining regions, the most important policy characteristic is that they be homogeneous with respect to unemployment. For reasons of data availability, the regions were constrained not to subdivide states. Pursuant to these criteria, CEAI computed the correlation coefficient between states for the monthly unemployment rates from January 1965 to July 1977, inclusive. As a preliminary rule of thumb, all adjacent states with a correlation coefficient of 0.8 or greater were grouped together. This procedure classified approximately two-thirds of the states into distinct regions. Additional judgment had to be used in classifying two types of cases. Some states on the border of a region had unemployment rates that were highly correlated with that of states in both adjacent regions. This was apparently due to the dual nature of those states' economies. Other states

³⁶ Timing was measured by the peaks and troughs of a three-month moving average of unemployment (using relative weights of 1, 2, and 1). The absolute unemployment rate was used for troughs. For peaks the cyclical deviations from trend of the unemployment rate were used.

³⁷ Severity is measured in two ways. The first is the difference between the maximum unemployment rate and the coinciding value of the secular (trend) level of unemployment. The second is the cumulative amount (integral) of unemployment above the secular level during the recession.

³⁸ Duration is the time in months between a peak in unemployment and the previous trough (see "timing" for these definitions).

³⁹ Volatility is the ratio of the cyclical maximum of unemployment to the number of months elapsed from the beginning of the recession.

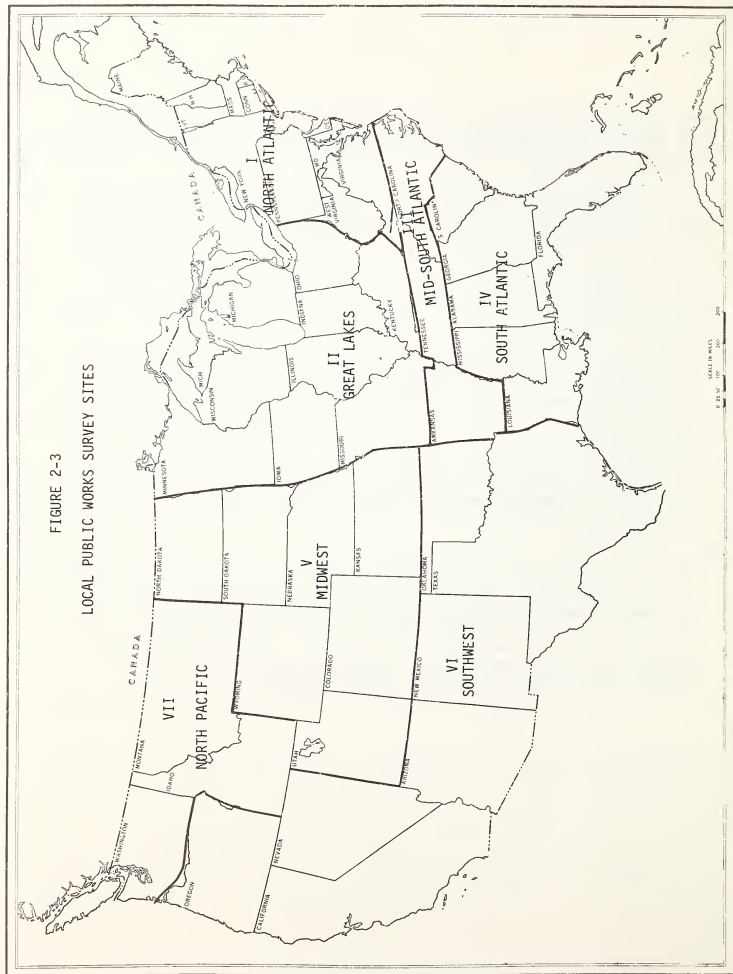
were not particularly highly correlated with any adjacent states. In several cases (plains states) they were grouped together as a separate region. In other cases they were judgmentally added to adjacent regions. The resulting regions are shown in Figure 2-3.

The projections of flows of materials was done on a state-to-state basis using the 1972 Census of Transportation Commodity Transportation Survey (CTS) results. First LPW projects were disaggregated by state of location and aggregated into the construction categories used in the analysis of industry impacts. Using the direct Chase/INFORUM materials requirement coefficients,⁴⁰ materials requirements by state were calculated. Adjustments were then made for local sources of supply and definitional problems with structural steel⁴¹ on the 57-industry level of detail. The CTS results were then aggregated to the 57-industry

⁴⁰ Tracing materials flows father back into the production process was judged to be beyond the scope of this study, since each stage in the production process would have to be analyzed in the same manner as direct materials requirements. This would require successive applications of the input/output model and CTS data. Furthermore, in the earlier stages of production much of the material was undoubtedly intra-firm shipments. Thus the use of CTS data would provide a misleading view of the inter-regional flows. Using the total requirements coefficients as a shortcut was judged to be an inferior technique, since it would implicitly assume that all phases of production originated at the project site, which is clearly incorrect. Also, spot checks revealed that in most cases the earlier stages of production occurred in the same region as the "final" materials stage.

⁴¹ The CTS data do not include shipments of less than 25 miles. Locally supplied materials were thus excluded from the subsequent calculations. "Locally supplied materials" were assumed to comprise agricultural production, mining (primarily stone, clay & gravel), and all services. This involved nine industries. The problem with structural steel is that its "fabrication" is really distribution rather than manufacture of products. Thus, supplies of fabricated structural steel were traced one step farther back in the production process. This reduced the number of industries to 56.

FIGURE 2-3
LOCAL PUBLIC WORKS SURVEY SITES



level of detail⁴² arrayed in an origin-destination matrix for each material.⁴³ These matrices were then converted to percentage form, by state of destination. That is, for each state of destination a sector was computed that showed the percent of the material shipped to that state which was shipped from each state.⁴⁴ These coefficients were then multiplied by the LPW materials requirements for each state, and the results were summed over materials. The result was a single origin-destination matrix of values of shipments of materials, on a state-to-state basis. The results were further aggregated into a value of net imports of materials for each state as a result of the LPW expenditures. Finally net material imports were deducted from total state LPW awards to obtain a measure of net LPW impact.⁴⁵

The above procedures do not deal with three possible sources of inter-state flows of expenditure: (a) because the CTS data deal with shipments from manufacturers to distributors, they do not allow for possible purchases by contractors from out-of-state distributors; (b) contractors themselves may come from a state other than that in which the project is located, in which case the expenditure flows across state lines; and (c) labor may be hired from out of state.

In the case of contractor's materials purchases, it was assumed that convenience to the site and transportation costs would tend to make most purchases local. Conversations with contractors confirmed this assumption. Analysis of the

⁴² Most of the CTS data are at the level of detail of 3-digit or 4-digit SIC industries. These have to be aggregated to match the input/output industries, which are at the 2-digit and 3-digit level of detail. In some cases, however, CTS data were at a much higher degree of aggregation. When this occurred, it could not be included in the subsequent calculations. This generally occurred in non-industrial states, for which the CTS data were rather sparse anyway. Results involving states with such data problems were computed and reported separately, as well as being included in the overall results. In order to assess the sensitivity of results to the omission of the highly aggregated CTS results, the entire estimation of flows was repeated on a more aggregated level, which included most of these observations. These results varied only slightly from the basic estimates.

⁴³ At this stage the number of industries had been reduced from 57 to 47 (see footnote 40). There were thus 47 matrices of size 48x48 (for the contiguous 48 states).

⁴⁴ The original CTS data were arrayed by state of origin. The purpose of this procedure, therefore, was simply to interpret the data from the other side - by state of destination.

⁴⁵ Equivalently, the net impact of the LPW program could be measured as grants to that state, plus net exports of materials.

type and size of projects strongly suggested that contractors would tend to be local,⁴⁶ and the type of labor requirements also strongly suggested local labor.⁴⁷ It was assumed, therefore, that materials suppliers, contractors, and labor were all in-state. CEAI's survey of contractors and subcontractors found very few exceptions to this pattern. Only three types of interstate flows were noted:

- Highly specialized materials or labor sometimes came from out of state
- When states were very small (primarily New England) materials, contractors, or labor sometimes came from an adjacent state
- When states were very sparsely settled (primarily in the plains and mountains of the West) some inputs came from an adjacent state

None of these exceptions appeared to involve significant inter-regional flows. CEAI therefore allowed the assumption of in-state materials, contractors, and labor to stand.⁴⁸ Thus the estimate of inter-regional flows of expenditure consists entirely of materials flows.

Estimates of inter-regional flows of materials were made by aggregating the estimates of inter-state flows. The net impact of LPW, by region, was computed in the same manner used for analysis of states. Net imports were also computed as a percentage of LPW grants to the region. Finally the impact of the LPW program, both gross and net of materials shipments, was compared with the regional shares of personal income tax to assess the inter-regional distributinal effects of the LPW program. These results are discussed in Chapter 7.

⁴⁶ The LPW projects were generally too small to attract major construction firms from any distance. The fact that they were local public works projects tended to give a competitive edge to contractors who were familiar with public-sector construction and with whom local officials were used to dealing. Such contractors tended to be local.

⁴⁷ Construction labor generally tends to be less mobile than other labor. Unskilled labor is similarly relatively immobile. Davis-Bacon requirements tended to require relatively high wages. If the work was done by a union contractor, the union tended to be a barrier to mobility. If the work was done by a non-union contractor, the highly paid skilled labor tended to be a regular employee of the contractor, and thus local if the contractor was local.

⁴⁸ This result is strongly influenced by CEAI's definition of regions. Since regions were established based upon homogeneity in unemployment there is little tendency for contractors, labor, or materials to lie near regional boundaries. Census Bureau regions, by contrast, cut through many urban areas, and had those definitions been used a considerable amount of inter-regional movement of contractors and labor might be expected.

CHAPTER 3: THE PATH OF LPW FUNDS

Before policy issues concerning the impact of LPW funds can be addressed it is important to understand what actually happened to the funds which were appropriated for the LPW program. The uses of these funds, the restrictions on them, and their side effects are the subject of this chapter. First the path of the funds is traced. Then two major side effects of LPW expenditures -- substitution and crowding out -- are discussed and evaluated. The results presented in this chapter are an "intermediate good" in the sense that the policy results presented in Chapters 4-8 of this report are based upon the understanding of the path of LPW expenditures as described in this chapter.

Uses and Restrictions of LPW Funds

The funds authorized for the Local Public Works program were to be used as categorical grants to state and local governments for the construction, demolition, renovation, or repair of public facilities.¹ The concept of construction includes architectural and engineering planning, but excludes acquisition of real property or maintenance. Further requirements stipulate that contracts shall be awarded by competitive bidding to private sector contractors, and that materials shall be domestically produced. These requirements and restrictions substantially determine the nature of the industry impacts of the program.

LPW grants may be used to make up the state or local share that matches Federal public works grant under another program, or the local share to match a similar state grant. The LPW funds may not, however, be used unless a project has not been initiated because of a lack of non-Federal funds.

The level of construction industry employment generated by the LPW program is primarily determined by the types of construction projects undertaken and the method of construction. In Round I the estimated labor intensity of the project was included as a criterion for selection of the project. The quality of these estimates were uncertain,² however, and selection of individual projects for Round II was left up to the localities. In Round I priority was given to projects and localities on the basis of unemployment.³ In Round II this priority was assigned on a state level only. Geographical targeting of LPW funds consisted primarily of

¹ The funds were authorized as part of the "Public Works Employment Act of 1976" (Public Law 94-369) and "Public Works Employment Act of 1977" (Public Law 95-28). See Chapter 1 for a full description and chronology of the LPW program. "Other" construction related improvements were also presented.

² Estimates were made by the applicant jurisdictions. They were not checked, and the methodology is unknown. Because "the extent to which proposed projects will contribute to the reduction of unemployment" was known to be a criterion in project selection, there is a a priori reason to believe that the estimates were biased upward.

³ Both the unemployment rate and the absolute level of unemployment were used in the selection process.

targeting grants toward localities or states with high unemployment. The authorization also contained a floor and ceiling on the amount that each state was to receive. In both cases these requirements influenced the distribution of jobs rather than the size of the effect on unemployment.

Many provisions in the authorization are designed to speed up the timing of impact. The most important of these was, of course, the date of appropriation. Additional provisions included requirements that (a) specific rules for project selection were to be promulgated within thirty days; (b) applications were to be ruled upon within 60 days of receipt by the federal government; and (c) on-site labor was to begin within 90 days of project approval. No federal or state funds from other programs were to be used unless they were "immediately available." Round I funds were to have been spent by September 30, 1977, and Round II funds by December 31, 1978. Such provisions, of course, were subject to the weather, and to the time required ex post to complete work on the projects.

Timing of Expenditures

Significant Round I LPW expenditures began in January, 1977, although a few small projects were initiated in late 1976. Round II expenditures began about nine months later, in October, 1977. The largest of the LPW projects are estimated to take up to 36 months for completion. Some small level of Round II LPW expenditures are therefore expected to continue through 1980.3. Of the total of both rounds, 19.9 percent took place in 1977; 61.4 percent is estimated to take place in 1978; 17.6 percent in 1979; and 1.1 percent in 1980. The median expenditure, with respect to time, was estimated to have occurred in June, 1978. The largest levels of LPW expenditures are also estimated to have taken place at about the same time. The time pattern of expenditure is presented in more detail in Table 2-2 and Figure 2-2.

The timing of LPW expenditures plays a crucial role in the LPW program's efficacy as a counter-cyclical policy, a subject discussed further in Chapter 8. The length of the program also has an effect on the employment impact, since the expenditures in the latter years are subject to significant crowding out effects and reduced leverage due to rising productivity and prices. Considering that the Round I appropriation was "for the period ending September 30, 1977," and the Round II appropriation was "for the period ending December 31, 1978," the LPW program does not appear to have had the quick, concentrated impact on the economy that it was designed to have had.

Substitution

The Concept of Substitution

Substitution is the use of federal funds to replace local funds. The effect of complete substitution is that the Federal expenditures produces no net increases in government expenditures. There are, however, two further elements in the definition of substitution. The first is the issue of how the replaced local funds are used. The second is the timing, relative to the Federal program, of the local expenditures that were replaced.

Local funds that are replaced must be used for some other purpose. The funds may be used for alternative government efforts. These efforts may be other types of capital budget expenditures such as the purchase of land or, in fact any expenditure within the local budget (capital or operating). The alternative use may also be implicit, as when a locality uses the funds to reduce a budgetary deficit or returns them to the private sector by reducing taxes. Each of these uses will produce an impact on the economy. However, except for the first use -- other construction activities -- this effect will be different in targeting, and probably in size, than the impact that the federal grants would have had, if substitution had not occurred.

The uses to which replaced local funds may be put delineates a typology of substitution. CEAI has found it most useful to define types of substitution in terms of the broadest identifiable category for which replaced funds are not used.⁴ CEAI's types are:

- Substitution denotes the situation which occurs when federal monies replace local monies on a specific project.
- Project Substitution denotes the situation which occurs when federal monies replaced local funds on a specific project and the funds are used for other construction activities.
- Construction Substitution denotes a case in which replaced local funds are not used for construction expenditures.⁵
- Capital Substitution denotes a case in which replaced local funds are not retained in the capital budget (i.e. in which they are used for operating purposes, deficit reduction, or are returned to the private sector).
- Locality Expenditure Substitution denotes a case in which replaced local funds are not explicitly spent by the locality, but are used to reduce the deficit and/or are rebated to the private sector.

⁴ Most information on alternate uses of local funds is somewhat incomplete. It is often limited to distinguishing the sorts of uses to which funds would not be put (e.g. locality expenditure) from those to which they might be put (e.g. reduced deficits or rebates to the private sector). In such cases the exact use of funds (e.g. reduced taxes or lower borrowing) may not be known. CEAI thus believes that the most effective typology of substitution focuses on the known categories for which funds would not be used, rather than the specific use to which funds will be put. However, we have made an exception to this typology in our definition of project substitution both to avoid having two terms, "substitution" and "project substitution" for the same phenomenon and to prevent confusion which might arise from the use of the phrase "project substitution" by CEAI in a manner different from that of EDA.

⁵ "Construction substitution" corresponds to EDA's concept of "fiscal substitution."

Any of these types of substitution may be partial or complete. From the point of view of the employment generating impacts of the LPW program, the most critical issue is the amount of net new construction generated, or concisely, the amount of construction substitution. Project substitution alone does not alter the nature of expenditure nor (except for minor differences in the employment intensity of different projects) the impact of the expenditure.

There are three possible patterns of substitution with respect to time. They are:

- Concurrent Substitution: A case in which the replaced local expenditures would have taken place at the same time as the federal expenditures.
- Project Acceleration: A case in which the replaced local expenditures would have taken place later than the federal expenditures.
- Project Delay: A case in which the replaced local expenditures would have taken place earlier than the federal expenditures.

The latter two patterns constitute intertemporal substitution. Project delay can be further subdivided into two cases. Short-run project delay is typically a speculative postponement of a project in the expectation that funds will be available from a specific program at some point in the near future. Long-run project delay is the indefinite postponement of a project under the general expectation that some type of funding will be available sooner or later.

Intertemporal substitution is of particular interest because of its potential for pro-cyclical or counter-cyclical effects outside as well as within the time frame of a counter-cyclical grants program. Project acceleration is likely to be counter-cyclical, since the replaced expenditure would have taken place at a later point in the business cycle when output and employment would have been higher. Short-run project delay resulting from a contemplated counter-cyclical program, however, is almost certain to be pro-cyclical. The expectations of receiving specific counter-cyclical funds are formed between the time of the proposal and implementation of the program -- a time when the recession is typically at its worst. Under these circumstances there is a high probability that expenditure would be transferred from a trough to a recovery.

The cyclic effects of long-run project delay are more difficult to assess. However, should a recession develop, it is most likely that the general expectation of counter-cyclic funding for public works activities is likely to have pro-cyclical effect. Also, it is clear that general expectations of future local public works financing will substantially increase the level of all types of substitution.

Estimation Procedures

The primary source for estimation of the magnitude of substitution in the LPW program was CEAI's survey of local government officials. The survey provided at least

three types of information: direct answers to survey questions⁶ (both factual and perceptual); additional observations by surveyors on the specific locality; and the general insights of CEAI analysts⁷ into the workings of LPW at the locality level.

A second source of data, locality financial documents, proved much less useful and provided only general insights into the locality budgetary process. The problem was that data were incomplete and too full of incomparabilities⁸ to allow either quantitative analysis or the tracking of flows of funds. A third possible source of information, estimates of substitution from other research, proved virtually non-existent for the LPW program.⁹ Alan Fechter of the Urban Institute aptly characterized the conclusions of previous efforts in the area in a comment that substitution was definitely "between zero and 100 percent."

A direct aggregate estimate of the level of overall substitution was based on the survey results. Separate analyses were conducted for projects that were funded under LPW and those that were not. The final analysis used responses on whether the project would have been built, when it would have been built,¹⁰ how fully it would have been funded, and from what source.¹¹ In the course of the survey and

⁶ The survey questions most pertinent to substitution are contained in Appendix B.

⁷ So as to gain first-hand knowledge of both the survey and the program, all CEAI project analysts, including the Project Manager, participated in the fieldwork.

⁸ Areas of incomparability -- both between localities and between budgets of one locality over time -- include categorization of funds and modes of transfer between funds, documentation of revenues and expenditures, treatment of transfers from other government units, and distinctions between capital and operating expenditures. The last issue is particularly troublesome, because it reflects not just accounting procedures but wide differences in perceptions about what constitutes a capital expenditure. Many of the incomparabilities also reflect a wide variety of procedures in budgeting and allocating funds.

⁹ Only one scholarly article was found dealing with any form of substitution in the LPW program: Edward Gramlich, "State and Local Budgets the Day After It Rained: Why is the Surplus So High?" Brookings Papers on Economic Activity, 1:1978, pp. 191-216. Gramlich does pioneering work in identifying the concept of project delay intertemporal substitution. However, his empirical methodology is so badly flawed (e.g. he forecasts using an equation with an $R^2 = 0.06$) that his results must be considered theoretical only.

¹⁰ In some cases the response was that a project would have been built piecemeal over a period of time.

¹¹ Some apparently promising lines of questioning proved impossible to interpret without further detailed information. The question of whether funding of a project had been attempted before, for example, had ambiguous interpretations. A positive response could have meant that a project had a high priority, but that circumstances (possibly including project delay substitution) had prevented its funding. Alternatively, a positive response could have meant that the project had not been funded because it was of low priority, but that the "attempt" had been made to satisfy some political group. The former case entails high substitution; the latter very little, if any.

analysis a further factor arose -- the issue of how certain it was when a project would be built. In many cases respondents replied that it could not be predicted when a project would be built, even with local funding available. In others, the construction was conditional on receiving some type of funding, and the respondent could not say when this might occur. Of perhaps the most importance CEAI surveyors found that most jurisdictions had a substantial "wish list" of projects that had been proposed, and for which some planning work -- possibly including an attempt at funding -- had occurred. For many of these projects the acquisition of complete funding appeared doubtful for many reasons including the severe competition from other "wish list" projects. In these cases, respondents appeared very reluctant to state flatly that such projects would not be built but rather, in CEAI's judgment, described these projects as ones which would be built with either an uncertain start date or with a start date that was beyond realistic planning horizons.

The distribution of the sampled LPW projects and by the existence, timing, certainty of timing, degree, and type of alternate funding expected is presented in Tables 3-1 and 3-2. These distributions for rejected LPW applications in the sampled localities are shown in Tables 3-3 and 3-4.

CEAI's analytical procedure resulted in a set of coefficients, or percentages of substitution, applied to each project. Where no specific data exist, the value of 0.5 is, of course, intuitively appealing as the midpoint of the range of possibilities. However, the estimated values of these coefficients were determined only after an extensive debriefing of the surveyors as to the appropriate percentage of substitution to be attributed to each relevant factor. The values assigned to the coefficients also tended to be confirmed by the (extremely scanty) quantitative evidence available. Where the surveyors had more specific information -- either as a quantitative response or from their observations of response to related and/or following questions -- this was used instead of the standard coefficient. The coefficients can be summarized as follows:

- Projects that reportedly would not be built without LPW funding were assigned a substitution coefficient of 0.0.
- Projects that would otherwise have been funded from non-local sources (grants) were assigned a substitution coefficient of 0.0.¹² An exception is revenue-sharing funds, which were treated as local funds.
- Projects that would have been funded partly from local sources and partly from non-local sources were assigned a substitution coefficient of 0.5.
- Projects for which the alternative funding was described as "partial" were assigned a substitution coefficient of 0.5.

¹² Legislation authorizing the LPW program is concerned only with substitution of local funds. Moreover, other Federal funds -- especially categorical grants -- will generally be spent on similar projects. Thus no more than project substitution will occur.

Table 3 - 1 Funding Alternatives for the Sample of LPM Projects, by Project

Funding Source:	General Funding	a) Bonds	Other Grants	Non-Local Funding (Grants)	Gen. Rev. & Bonds	Gen. Rev. & Grants	Gen. Rev. & Grants	TOTAL
Time Period								
b) Immediate Start								
100% funding	9	8	5	2	5	-	8	37
partial funding	1	6	-	1	-	-	1	9
Years 3-4								
100% funding	1	1	-	-	1	-	1	5
partial funding	-	2	-	-	-	-	-	2
Piecemeal								
100% funding	2	1	2	-	-	-	-	5
partial funding	-	4	-	1	-	-	-	6
Uncertain Timing:								
within 5 years	6	7	3	1	-	1	6	31
100% funding	2	3	1	11d	-	2	1	29
partial funding	-	-	-	-	-	-	-	-
Over Five Years								
100% funding	1	2	-	-	1	-	-	4
partial funding	-	3	-	-	-	-	1	5
Not Built								
								41
Data Not Available								3
TOTAL	23	37	11	16	7	3	18	177

- a) Includes four projects that would have been funded partly through private capital, two by a tax increase, and four by other unspecified means. The two properties were included with bonds because the source was the local private sector; the third because the private sector was the most probable source.
- b) Project began this year or next, and completed within the year after next.
- c) Work done in stages over the next five to ten years.
- d) Includes five projects for which the means of finance and the degree of completion are not specified.

Table 3 - 2 Funding Alternatives for the Sample of LPI Projects, by Obligations

Funding Source: Line Period	General Revenue	a) Other Bonds Grants	Non-Local Funding (Grants)	Gen. Rev. Bonds	Gen. Rev. Grants	Bonds & Grants	Gen. Rev. & Grants	TOTAL
Immediate Start								
100% funding	2243	1348	5808	2527	8224	4759	-	36829
partial funding	159	4184	-	176	-	163	-	4662
Years 3-4								
100% funding	317	1327	-	262	-	440	41	2407
partial funding	-	3300	-	-	-	-	-	3300
Piecemeal								
100% funding	356	732	439	-	-	-	4530	1527
partial funding	-	3374	-	106	-	-	-	8062
Uncertain Timing:								
within 5 years								
100% funding	1639	4573	8090	415	4389	6219	4624	30019
partial funding	6700	2602	442	9154d)	2127	939	23924	45908
Over Five Years								
100% funding	555	3601	-	1839	-	-	-	5995
partial funding	751	10128	-	-	850	-	-	11709
Not Built								46775
Total Not Available								3846
TOTAL	12720	47149	14779	12360	10345	7406	33239	150538 ^e

a) Includes four projects that would have been funded partly through private capital, two by a tax increase, and four by other unspecified means. The first two categories were included with Bonds because the source was the local private sector; the third because the private sector was the most probable result.

b) Project began this year or next, and completed within 1 year after next.

c) Includes five projects for which the years of finance are not specified.

d) Includes five projects for which the years of finance are not specified.

e) Total excludes figures listed for projects not built and data not available.

TABLE 3-3
FUNDING PLANS FOR REJECTED PROJECTS, BY PROJECT

<u>Funding Source</u>	<u>Local Funds</u>	<u>Bonding</u>	<u>Grants</u>	<u>Grants and Local Funds</u>	<u>Total</u>
<u>Time Period</u>					
First Year					
100% funding	9	1	2	2	14
partial funding	4	1	-	-	5
Second Year					
100% funding	1	-	-	-	1
partial funding	-	-	-	-	0
Years 3-5					
100% funding	-	-	2	-	2
partial funding	1	-	-	-	1
Over 5 Years					
100% funding	1	1	-	1	3
partial funding	-	-	2	-	2
Uncertain Timing					
Within 5 Years					
100% funding	9	2	7	7	25
partial funding	7	1	3	5	16
Piecemeal: 1-3 Years					
100% funding	3	-	-	1	4
partial funding	1	-	-	-	1
Piecemeal: 5-10 Years					
100% funding	1	1 ^a	1	-	3
partial funding	2	-	1	-	3
	39	7	18	16	80
Not Built:					
a) Private Funds					11 91

TABLE 3-4
FUNDING PLANS FOR REJECTED PROJECTS BY APPLICATION REQUEST (\$1000)

<u>Funding Source</u>	<u>Local Funds</u>	<u>Bonding</u>	<u>Grants</u>	<u>Grants and Local Funds</u>	<u>Total</u>
<u>Time Period</u>					
First Year					
100% funding	14,456	3,850	209	2,865	21,380
partial funding	2,165	1,118	-	-	3,283
Second Year					
100% funding	218	-	-	-	218
partial funding	-	-	-	-	0
Years 3-5					
100% funding	-	-	1,414	-	1,414
partial funding	474	-	-	-	474
Over 5 Years					
100% funding	58	866	-	1,249	2,173
partial funding	-	-	684	-	684
Uncertain Timing					
Within 5 Years					
100% funding	8,853	2,476	4,418	3,141	18,888
partial funding	9,332	656	1,952	4,587	16,527
Piecemeal: 1-3 Years					
100% funding	7,128	-	-	1,000	8,128
partial funding	344	-	-	-	344
Piecemeal: 5-10 Years					
100% funding	42	306 ^a	246	-	594
partial funding	1,854	-	558	-	2,412
	44,924	9,272	9,481	12,842	76,519
Not Built:					
a) Private Funds					18,558
					95,077

- Projects whose construction start date could not be estimated by the respondent ("timing uncertain") were assigned a substitution coefficient of 0.5.
- Projects with reported start dates beyond a five year time horizon were assigned substitution coefficients of 0.0, unless the surveyor had additional information to suggest that the project would actually be built.¹³
- Repair projects (primarily streets) involving a number of distinct sites were assigned a substitution coefficient of at least 0.75, regardless of other factors.¹⁴

All the above substitution coefficients, except those for repair projects¹⁵ involving a number of distinct sites, were assumed to interact multiplicatively. For each project the overall substitution coefficient was multiplied by the LPW obligations to obtain a dollar estimate of substitution. Based on analysis of LPW-funded projects, the aggregate gross estimate of overall substitution was 26.6 percent of the sampled obligations.

For purposes of assessing the impact of the LPW program, it is not the level of overall substitution that is of primary interest but the level of construction substitution. Project substitution itself does not materially alter the impact of LPW expenditures. Unfortunately the survey results of the more specific types of substitution are not very clear. In general, locality officials had little idea exactly how and when the "saved" funds would be spent. However, the respondents were able to provide some estimate of where the "saved" money would have come from. The responses indicate that, in the absence of the LPW program, just over 25 percent of alternative financing would have come from general revenues, and the other 75 percent would have come from bonds or other private sector contributions. Respondents generally did not distinguish, however, between financing from capital funds or operating funds. Indeed the lack of clear (much less consistent) distinctions between capital and operating funds, and the prevalence of transfers among funds that was found in our analysis of the financial documents suggests that such a distinction may be impossible for projects that would have been financed in future fiscal years.

¹³ In most of these exceptions, the project was a type of municipal service that would be required because of local growth in the foreseeable future. The individual substitution coefficient was judgmentally estimated by the surveyor in such cases.

¹⁴ This type of project regularly appears in budgets of larger jurisdictions. The surveyors therefore judged that this case was much more likely simply to be project acceleration than was the average project.

¹⁵ Thus, for example, a project that would reportedly be partially funded (with certainty) by a mixture of local and grant funds was assigned a substitution coefficient of 0.25. If, in addition, the timing was uncertain, the substitution coefficient was 0.125. All projects with a substitution coefficient of 0.0 as a result of any factor therefore had an overall substitution coefficient of 0.0.

Lacking actual data on alternative financing from capital budgets, CEAI has made a rough estimate of project substitution based upon the assumption that 25 percent of the "saved" general revenues would be spent in the capital budget. This results in an estimate of project substitution via the capital budget of only 1.7 percent of LPW obligations.¹⁶ Project substitution financed through unallocated bond funds would make this figure somewhat higher.

A second adjustment must be made for increases in local construction expenditures that were generated by the LPW program. Survey responses indicated that the total cost of the LPW projects in the sample were 8.1 percent higher than the sum of total costs shown on EDA records.¹⁷ This complementary expenditure must be subtracted from the above estimate of overall substitution (26.6 percent) to obtain a net value of substitution.¹⁸

An important analytical issue is how to treat jointly these two adjustments (1.7 percent project substitution and 8.1 percent complementary expenditure). It would be double-counting to add local dollars released to the budget and spent on capital items (project substitution) to local capital funds used for complementary expenditure; the latter funds represent reduced expenditure on other construction. Only to the extent that funds released to local capital budgets exceed complementary expenditure from that source is there an additional effect. According to the survey responses, about 24 percent of complementary expenditure (1.9 percent of LPW obligations) came from capital budgets. If we subtract the 1.9 percent of LPW obligations which would have been spent anyway from the 8.1 percent of complementary expenditure we have net construction complementary expenditures of 6.2 percent. Adding the 1.7 percent project substitution from capital budgets calculated earlier yields net "project substitution"¹⁹ of 7.9 percent. At first one might think that by simply subtracting this 7.9 percent from the estimate of gross substitution (26.6 percent) would yield the amount of net construction substitution. However two problems remain. First, some localities have "bond funds" which result from the floating of a large construction bond and gradual use of these funds for construction projects as the need arises. The total amount of complementary expenditures coming from this type of funds is estimated to be 0.5 percent of LPW expenditures. The amount of construction resulting from the replenishment of these

¹⁶ Project substitution (as a percent of LPW obligations) equals overall substitution (as a percent of LPW obligations), times the fraction of substitution involving local government revenues, times the share of the local budget devoted to capital expenditure, or: $(0.266) \times (0.25) \times (0.25) = 1.7$

¹⁷ Surveyors found two primary reasons for this difference. One was cost overruns that were financed out of local funds. The second was an occasional local decision to enlarge the project substantially beyond what had been reported on the application. In a few cases, this involved using LPW funds as seed money to encourage private funds.

¹⁸ It may be useful to think of this complementary expenditure as a type of project substitution. Technically, the two are the same only if local funds that would have been used on one project in the absence of the LPW program are used on another project in the same jurisdiction. Thus, in the aggregate the effect is much like that of project substitution.

¹⁹ See Footnote 18.

funds through substitution is unknown but is probably small. Second, in several cases CEAI surveyors noted that the complementary expenditures went for activities other than construction such as the purchase of real estate. For the purposes of this study, CEAI has assumed that the amount of addition construction in the LPW period resulting from the replenishment of the bond funds was equal to the amount of complementary expenditures from these funds. Also it was assumed that the amount of non-construction complementary expenditures was approximately 1 percent. Combining these factors -- and ignoring the spurious precision implied by the decimals in the intermediate calculations -- yields an estimate of net construction expenditures of 20 percent.²⁰

As part of the analysis of substitution, CEAI analyzed many of the characteristics of a locality in an attempt to identify influences on the levels of substitution. Levels of substitution were computed for each locality in the survey, and these were compared with total obligations to the locality, locality size, type of locality, SMSA status, region, a composite measure of difficulty of bonding,²¹ and the ratio of LPW obligations to a measure of local capital expenditure.²² The results were not notably successful. Instead it appears that the factors determining the amount of substitution were generally individualistic and depended in large part upon the particular locality officials' coincidental confluence of needs and the availability of the LPW funds.

CEAI also analyzed inter-temporal substitution in terms of the planned construction date (in the absence of the LPW program) given in the responses. The greatest difficulty in this procedure is defining a realistic definition of time periods. The difficulty stems from the fact that the LPW program involves substantial expenditure over a three year period. This is a longer period than the realistic planning horizon of many localities. Moreover, the majority of LPW expenditures occur in the second year of the program, so that project acceleration could not logically be said to occur unless the project would otherwise have been built in the third year or later. This, in fact, was the definition of project acceleration that was used. No direct evidence of project delay was found. Two additional inter-temporal effects are noted: project acceleration when the alternative funding source is grants, and possible project delay of the non-LPW funded projects. Neither of these, however, is substitution per se.

A major concern in estimation of substitution is the potential limitations inherent in any survey. Three major potential limitations exist: (a) the accuracy of responses; (b) limitations stemming from the size of the sample; and, (c) the problem which arises when some information is either unknown or unknowable.

²⁰ Gross substitution (26.6 percent) minus net induced expenditures (7.9) plus induced non-construction expenditure (1 percent) yields the estimate of construction of 19.7 percent, or approximately 20 percent.

²¹ This measure was compiled from questions on the date, type, and fate of the last bond issue, and on community attitudes on floating bonds or raising taxes (see Appendix B). The localities were classified judgmentally as the evidence of fiscal constraints being "none," "some," or "fairly conclusive."

²² Local capital expenditure was measured as the 1976 capital expenditure reported in the written questionnaire, times the fraction of capital expenditure reported to be financed from local sources.

The survey procedure involved several means of checking the answers. Interviewing several respondents in a locality made it possible to distinguish between facts and perceptions in most cases and to identify discrepancies that needed further reconciliation. The oral format put each answer in context, and allowed rephrasing or followup if an answer seemed inconsistent with other responses. The internal pattern of answers also suggested that answers were satisfactorily responsive.²³ Some difficulties were encountered with individual officials who were not particularly knowledgeable about the LPW projects, but these respondents were easily identified. Assimilation and interpretation of direct responses to questions and other observations required judgment of the surveyors. However, all of CEAI's surveyors were full-time professionals who were quite familiar with the issues and problems to be addressed. It is CEAI's judgment that the survey data used in the estimate of substitution are without substantial bias.

The sample itself is limited in size to 50 jurisdictions. It was carefully chosen for representativeness with respect to region, jurisdiction type, jurisdiction population, overall level of LPW funding, and SMSA status.²⁴ As such, the aggregate estimate of substitution is representative. Two problems arise, however, in any attempt to analyze the causes of substitution. First, the sample size is small enough that disaggregation by values of any variable reduces the number of observations in any cell to such a low level that precise statistical analysis becomes virtually impossible. Second, CEAI's analysis suggests that some of the most important influences were not, and could not be, among the variables used in sample selection.²⁵ The result is that any attempted statistical relationship is plagued by a large proportion of special case outliers, and analysis quickly evolves into individual analysis of these observations.

Perhaps the most important limitation of a survey effort such as this is that some of the information is inherently hypothetical rather than observable. One

²³ Although substitution is clearly illegal, respondents stated that a project would not have been built without LPW funds in fewer than 25 percent of the cases. Moreover, although there were some cases of an official's giving identical answers for a number of projects, the general pattern of response was a variety of answers for the different projects within a locality, together with some degree of volunteered explanation of the circumstances of the project. It therefore appears that these questions were, on the whole, answered individually and candidly.

²⁴ See Appendix B for the exact distribution. The sample was also representative of project size, round, and number of projects in a locality. (As noted, localities inside SMSA's were purposely oversampled.) Selecting a sample of 50 localities that was precisely representative of project-specific, as well as locality-specific, variables would have been exceedingly complex. One potential problem that did arise was that a high proportion of both projects and funds came from the two largest localities (Philadelphia and Detroit). The average level of substitution of these two cities, however, approximately equaled the average level of substitution of the sample as a whole. Thus the potential dominance of these two localities does not appear to have imparted any significant bias to the main findings of the survey.

²⁵ These influences included local fiscal constraints, local grantsmanship tactics, and the timing of LPW funds relative to the appearance of local specific needs and local budgeting procedures.

specific difficulty is that the universe is not neatly divided between projects that would not be built and projects that were "previously appropriated or planned." As noted earlier, most localities have a substantial "wish list" of partially planned projects, whose probability of future construction can only be estimated. Second, any question of what would have been done in the absence of LPW funds is purely hypothetical. This applies to project delay as well as project acceleration. Thus direct objective questions pertaining to project delay inter-temporal substitution cannot be asked.

Substitution Estimates

Based on the above analytical procedures, CEAI has made the following quantitative estimates of substitution:

- Based on analysis of LPW-funded projects, overall gross substitution is estimated to be 26.6 percent of LPW obligations.
- Additional expenditure on LPW projects financed from local funds is estimated to be 8.1 percent of LPW obligations.²⁶
- Locality expenditure substitution was estimated to be 74.6 percent of overall substitution, or 19.8 percent of LPW obligations.
- Based on analysis of funded projects, capital budget substitution (which is equivalent, in this case, to substitution net of complementary expenditures) is estimated to be 18.5 percent of LPW obligations.
- Based on analysis of LPW-funded projects, construction substitution²⁷ is estimated to be 20 percent of LPW obligations.
- Project acceleration²⁸ is estimated to constitute 43.7 percent of overall (gross) substitution.
- LPW funds are estimated to have accelerated 71.9 percent of expenditure that would have been financed by other grants.

²⁶ This measure corresponds to EDA's concept of fiscal substitution.

²⁷ Of these expenditures, 67.0 percent were reported as having been raised especially for the project, 23.8 percent as coming from capital budgets, 6.4 percent as coming from operating budgets, and 2.8 percent were not identified by source. Because these proportions are roughly the same as the identifiable ultimate uses replaced funds (see Footnote 26), CEAI estimates that locality expenditure substitution is also about 70 percent of construction substitution, or 14 percent of LPW obligations.

²⁸ Project acceleration is defined as expenditure made in the first two years of the LPW program (1977-1978) that would otherwise have been made at a later date (1979 and beyond).

The estimated level of substitution varied greatly among sample localities, as is shown in Table 3-5. CEAL therefore sought to explain this variation in terms of the variables used in sample selection. Summary tables of these distributions of the sample observations are presented in Appendix C. CEAL also explored a measure of local fiscal constraint, the timing of LPW funds, and local grantmanship strategies as possible explanations. Analysis was greatly complicated by several factors:

- The sample is too small for effective statistical analysis.
- No one or two explanations seem to determine the level of substitution for the sample as a whole. Instead, each explanation seems to dominate a relatively small number of cases.
- Different influences appear to interact in complex ways.

The result of these factors is that any attempt to determine the relationship between any potential cause and the level of substitution requires individual inspection of outlying observations.

The results obtained from the analysis of individual localities can be summarized as follows:

- Type of locality, level of total obligations, and SMSA status appear to have little relationship to substitution.
- A slight regional pattern is observed (the Great Lakes and South Atlantic Regions had levels of substitution that were substantially below average). This could be largely explained, however, in terms of other factors.²⁹
- There is a distinct -- but by no means unanimous -- tendency for large and/or older industrial cities to have relatively low substitution.³⁰
- Difficulty of access to capital funds appears to be related to substitution in a rather wide range of cases. (This factor is perhaps the only generally applicable explanation of the level of substitution.) For the most part this tended to produce a low level of substitution. However, when combined with a project so urgent that it

²⁹ The localities in the South Atlantic Region all had some combination of high demand for public capital; extreme poverty; and/or intense resistance to bonding. The Great Lakes Region was dominated by large cities (which may itself have been a factor), several of which faced poor access to capital markets.

³⁰ Cleveland, Detroit, Milwaukee, and San Antonio all are estimated to have substitution far below average. Philadelphia and San Diego are major exceptions.

TABLE 3-5

Level of Overall Substitution, by Locality

<u>Locality No.</u>	<u>Locality Name</u>	<u>No. of Projects</u>	<u>Average Level of Substitution</u>
1	Alton	2	0
2	Bedford Co	1	0
3	Bethlehem	1	100%
4	Brewton	1	0
5	Chicago	5	25%
6	Cleveland	4	16%
7	Collier Co.	3	9%
8	Conneville	3	100%
9	Deland	1	0
10	Detroit	17	10%
11	Durham	1	50%
12	Elkins	2	33%
13	Erie	5	31%
14	Evanston	2	12%
15	Fairfield	1	50%
16	Great Falls	2	88%
17	Greenbelt	1	100%
18	Henderson	5	8%
19	Iron Co.	1	0
20	Kingman	1	50%
21	Mars	1	25%
22	Milwaukee	10	15%
23	Muskegon	1	0
24	Nashua	5	40%
25	Passiac	3	50%
26	Philadelphia	35	49%
27	Portland	9	87%
28	Providence	4	14%
29	Renton	3	35%
30	Roanoke	5	95%
31	Rome	4	5%
32	Roy	1	25%
33	Salem	2	84%
34	San Antonio	4	0
35	San Diego	8	61%
36	Saratoga	1	0
37	Savannah	1	0
38	Seaford	3	50%
39	Sedalia	2	39%
40	Sequin	1	50%
41	Silver City	1	100%
42	Slidell	1	0
43	South Bend	2	41%
44	Springfield, Ky.	2	0
45	Springfield, Ma.	3	2%
46	Tucson	1	100%
47	Uinta Co.	2	25%
48	Vernon	1	0
49	Watervliet	1	75%
50	Worcester	1	0

would have had to be built anyway,³¹ difficulty of access to capital funds seemed to guarantee high levels of substitution.

- The funding of a small number of projects tended to be associated with extreme levels of substitution.³² This suggests that the degree of substitution was related to project characteristics as well as locality characteristics.
- In a significant number of cases the size of the LPW grant is substantially larger than the locally funded capital budget. In such cases there appears to be a fairly strong tendency for substitution to be quite low.
- The particular selection and grantsmanship tactics used by local officials appears to play a significant role in the level of substitution. These tactics probably, but not necessarily, tended to lower the level of substitution.³³ (Some localities virtually never financed construction from their own funds. Such cases usually had some combination of difficulty raising funds, little or no growth, and/or small size.

As part of the analysis, CEAI analyzed a sample of projects applied for but not funded by the LPW program. The resulting estimate of potential "substitution" (i.e. actual subsequent funding of these projects) was 40.7 percent, which is 50 percent higher than the estimate based on LPW-funded projects. CEAI believes that the difference in estimates of overall substitution is primarily a reflection of an inherent bias in the sample of non-LPW projects. Potential "substitution" in rejected projects is relatively highly concentrated (over 25 percent) in projects funded

³¹ Although "urgency" obviously comes in various degrees, CEAI surveyors found a number of projects that were being constructed as a result of such events as availability of matching grants, bridge collapses, sewer breaks, EPA orders, court injunctions, and tornado damage. If LPW funds became available after the need arose but before local funding had been arranged, substitution was highly probable.

³² Fourteen of eighteen cases with estimated substitution of zero or 100 percent had only one project.

³³ In order to maximize local capital funding, some local officials appeared to pursue a policy of using LPW funds for projects that would be difficult to fund locally. CEAI's analysis of construction category variations between Round I and Round II suggested that local officials tended to select a higher proportion of local municipal buildings and other general facilities that they might have an interest in, but which had no particular constituency. In the survey sample there were several projects that were actually highly controversial. Surveyors also noted a tendency of local officials to search out grants to fill needs that they perceived would be difficult to finance locally. Such tactics would tend to produce low levels of substitution if local officials' perceptions are accurate.

this year from general revenues. This suggests that local officials tended to initiate their highest priority projects anyway, and save lower priority projects (with correspondingly lower probabilities of substitution) for possible (and actual) funding in Round II.³⁴

Public finance literature³⁵ tends to suggest that larger older cities will have relatively high levels of substitution. This prediction is based on a number of urban characteristics, including:

- Relatively service-oriented (rather than capital-intensive) local functions
- A relatively large existing capital stock
- Complex decision-making processes
- Fairly ready locality access to capital funds
- High absolute levels of public spending
- Stable population

The finding that a majority of the large and/or old cities have low substitution appears to contradict the theoretical result. Closer inspection reveals, however, that most of the exceptions have relatively difficult access to capital markets (e.g. Chicago, Milwaukee, Cleveland, Detroit), or ambitious urban-renewal programs

³⁴ There is also a possibility that the sample and responses of rejected projects is biased. In the first place the selection process depended somewhat on the respondents' familiarity with the projects in cases where more than five rejected applications had been made for a locality. If the respondent was familiar with a project because it was being built, this would bias the estimate of substitution upwards. Secondly, the wording of the rejected-projects question asked about actual plans, rather than hypothetical plans in the absence of LPW. If the LPW grant had been large, the resulting upward shift of the local capital budget constraint could have enabled more projects to be done, which would also have biased upward the estimate of substitution.

The other most likely explanation of the tendency to build rejected projects is provided by Gramlich, who argues that speculative project delay affected projects not funded by LPW as well as resulting in substitution proper. By this line of reasoning, the burst of construction of rejected projects merely reflects local decisions to go ahead with these projects after they were rejected. The problem with this argument is that it treats Round I and Round II asymmetrically. At the time of local budget formation, Round II was farther along, more certain and larger than Round I had been one year previously. This should have been an even greater incentive to await Round II funds than Round I funds. Yet there are very few rejected projects definitely planned in the immediate future (2 to 5 years), now that the outcome of Round II allocations is known. This clearly contradicts Gramlich's hypothesis.

³⁵ A standard source is: Richard A. Musgrave and Peggy B. Musgrave, Public Finance in Theory and Practice (New York: McGraw-Hill, 1973), pp. 614-620.

that entail replacement of substantial public capital (e.g., Detroit). A city that almost exactly matches the hypothesized characteristics of the "larger older cities" (Philadelphia) was estimated to have a high level of substitution.

No particular evidence was found of the sort of project delay posited by Gramlich, in which localities defer projects in anticipation of funding, and then build them anyway if they are not funded. This, of course, is not actually substitution. The issue was therefore not part of the research effort. Nevertheless the data collected do not tend to support this hypothesis (see Footnote 35). Macroeconomic data are not yet available, because analysis requires data on a considerable period after the LPW awards. The preliminary BEA state and local government capital expenditure data for the time since Round II began are ambiguous and inconclusive. They do indeed show a sharp increase in these expenditures during mid 1978 (as Gramlich would predict). Yet this upturn is not so large that it cannot mostly be explained by recovery from an abnormally severe winter, plus the LPW program itself. It is CEAI's judgment that this project delay effect, if it existed, would have involved a delay of approximately \$1 to \$2 billion of state and local expenditures for no more than one or two quarters.

CEAI has used as its basic measure of substitution the estimate of construction substitution equal to 20 percent. Analysis of potential determinants of substitution suggested that the sample was too small to obtain separate estimates of substitution on the basis of round, time, project type, or similar variable. CEAI therefore applied the estimate of 20 percent to all LPW expenditure and to indirect and induced effects.

The estimate of construction substitution equal to 20 percent applies to the existing LPW program. CEAI's field experience and the history of programs such as revenue sharing, however, strongly suggest that local government officials have a substantial learning curve. A similar "one-shot" program, such as an LPW Round III, or an ongoing program of support for local public works, could be expected to have substantially higher levels of substitution -- particularly short-run and long-run project delay.

Crowding Out

The Concept

Crowding out is the displacement of other economic activity as a result of unused government expenditures. Crowding out characteristically occurs through a market process. Either through price rationing or through the development of physical shortages of materials, labor, or capital, other demands are prevented from generating real output and employment. This can occur either because markets are generally tight or because of specific bottlenecks, although it is generally much more serious when the economy is strong than in recessions. In either case, the effects of crowding out must be deducted from the employment generated by a program such as LPW to obtain a net impact.

Estimation Procedures

Estimation of crowding out effects of the LPW program was done using the CEAI Macroeconomic Model. This model was simulated with and without the LPW expenditures.

Simulation results are shown at the sectoral level and aggregated to the entire economy. Isolation and measurement of crowding out effects is complicated, however, by two characteristics of the results. First the simulation results show only the net impact of an expenditure without distinguishing between the positive and negative effects. Second the LPW program is so small relative to the economy that most sectoral impacts are rounded to zero or have a high margin of rounding error. In order to deal with these constraints, CEAI divided the analysis of crowding out into two parts: direct crowding out and other crowding out.³⁶

Direct crowding out was estimated to be the quarterly net reduction of expenditure in all components of the construction industry.³⁷ This change in expenditure

³⁶In addition, CEAI explored the potential for crowding out at the local level based upon: (a) responses to the contractor survey, (b) the survey of local officials in localities with populations under 10,000 (9 sites); and (c) telephone interviews with officials of seven of the most isolated localities receiving LPW funds of over \$2,000,000. Only isolated instances of possible crowding out were observed. They tended to be in rapidly growing localities (mostly related to the energy boom). If there was a victim of crowding out, it was probably residential construction. There was also reported to be a shortage of concrete, although this was a regional problem (at least in the first half of 1978 when the analysis was undertaken). In general any difficulty in locating local labor, contractors or materials simply meant that those inputs would come from as far afield as necessary. In sparsely settled areas the construction market is already geographically large, and the LPW programs were readily absorbed with hardly a ripple of crowding out. Furthermore, in many cases contractor's seemed to regard LPW work as less desirable than private sector work. Thus, even in cases where contractors were scarce the result tended to be higher or fewer bids on the LPW project rather than the crowding out of private sector projects.

The lack of perceived crowding out on the local level can easily be reconciled with the national results. First, the LPW program involved thousands of localities, so that the demands for inputs must have interacted in the aggregate. The lack of perceptible crowding out at the local level thus does not imply the absence of crowding out at the aggregate level. Second, the local observations were based on experience through 1978.2. Until after this period, the macroeconomic simulation suggests overall crowding out was minimal.

³⁷A very small portion of LPW expenditure was on housing. Thus the net effect on residential construction (single-family and multi-family housing) is made up almost entirely of crowding out. As expected, this net impact is negative throughout the LPW period, but it is not substantial until late 1978. Since the primary effect on non-residential construction is the LPW expenditure itself, crowding out as defined above (i.e. a negative impact) is not observed until 1980. Thus crowding out is understated in this case, although if the pattern is the same as in residential construction, the omission is probably serious only for 1979.

was multiplied by the corresponding labor requirements coefficients³⁸ to obtain a measure of employment lost in the construction industry due to crowding out.³⁹ The effects were then traced through the economy by assuming that the crowding out loss in each quarter was the same fraction of employment generated for indirect and induced employment as for direct (construction) employment.

All other crowding out effects are implicitly measured by the use of the employment multiplier⁴⁰ derived from the CEAI Macroeconomic Model simulation in estimating total employment.⁴¹ This simulation of the actual LPW program was compared with a parallel simulation that assumed that the LPW expenditure⁴² had taken place beginning in 1974.2. The total and indirect employment impacts of the actual LPW simulation are substantially smaller than those of the alternative scenario. Had the LPW expenditure taken place earlier in the recessionary period, the total employment generated would have been an estimated 13 percent higher than actually occurred, and non-construction employment would have been 16 percent higher. Much of this difference is due to crowding out.

³⁸ BLS coefficients were used, adjusted on an annual basis for price and productivity changes. For non-residential construction an unweighted average of coefficients was used.

³⁹ Because this estimate was based on simulation results for expenditure, rather than simulation estimates of employment, the results are comparable with the BLS-based and INFORUM-based estimates of employment in person-years (see Footnote 41).

⁴⁰ The employment multiplier is the ratio of total employment generated to direct (construction) employment generated. Because the simulation and the resulting estimate of construction employment are net of direct crowding out as defined and derived above, these effects are not double-counted in this implicit measure of other crowding out effects.

⁴¹ The employment multiplier is estimated from the simulation to be just under 3.0. This is multiplied by an average of direct and indirect employment (which are approximately equal in size) in order to obtain a better estimate of the timing pattern of the change in total employment. Since the employment multiplier reflects other crowding out, this estimate of total employment is net of all but direct crowding out.

⁴² Expenditure was simulated to be the same in real terms as the actual LPW expenditure, and it was assumed to follow the same time pattern once initiated. Adjustments were also made for productivity changes.

Results

Estimates of construction crowding out, by quarter, are shown in Column 1 of Table 3-6. The loss of construction employment is estimated to be 7976 person-years, or 9.0 percent of gross direct employment generated by the LPW program. Of this amount 4,949 person-years is estimated to have occurred in single-family residential construction; 1530 person-years in multi-family residential construction; and 1497 person-years in non-residential construction. Estimates of indirect, induced, and total employment losses due to crowding out in the construction industry are also included in Table 3-6. The total job loss due to construction crowding out is estimated to be 24,189 person-years, or 9.0 percent of total LPW job creation.

All other crowding out is implicitly included in the projections of total employment generation reported in Chapter 4. As noted above, this level of crowding out is estimated to be larger -- by 16 percent of all job creation (14,710 person-years) -- than would have existed had the LPW program been initiated in mid-1974.

TABLE 3-6
EMPLOYMENT LOSS DUE TO
CROWDING OUT IN THE CONSTRUCTION INDUSTRY

Quarter	Direct Employment Loss Due to Crowding Out	Indirect Employment Loss Due to Crowding Out	Induced Employment Loss Due to Crowding Out	Total Employment Loss Due to Crowding Out
1977.1	72	91	82	245
1977.2	87	108	98	293
1977.3	182	228	205	615
1977.4	182	212	197	591
1978.1	313	336	325	974
1978.2	466	473	470	1409
1978.3	651	585	618	1854
1978.4	659	616	639	1914
1979.1	661	671	666	1998
1979.2	712	706	709	2127
1979.3	830	621	726	2177
1979.4	799	766	783	2348
1980.1	796	879	838	2513
1980.2	773	855	815	2443
1980.3	793	999	896	2688
TOTAL	7976	8148	8067	24189

CHAPTER 4: EMPLOYMENT CREATION IMPACTS

Employment creation -- and particularly the creation of employment in the construction industry -- is a primary goal of the local public works program.¹ In the 1974-75 recession the overall unemployment rate had risen as high as 9.1 percent, and unemployment in the construction industry peaked at 22.1 percent (see Figure 4-1). Within months of these peaks the first public works bill had been passed by the Congress, but it was vetoed. Although the unemployment rate did decline from its 1975.2 peak, it remained high. In early 1977, as Round II was being debated for passage, the overall employment rate was still about 7.5 percent -- well above levels usually considered acceptable. Unemployment, in construction was still about 15 percent, and according to organized labor² unemployment in some areas and in some trades exceeded 60 percent.

The purpose of this chapter is to report on CEAI's findings on the impact of the LPW program as a means of employment creation. Particular emphasis will be devoted to the employment creation impacts within the construction industry. First the results are presented and assessed. Next they are compared with other employment estimates and prior expectations for the LPW program. The chapter concludes with a brief discussion of policy implications. The specific issue of timing -- or counter-cyclical efficacy -- of the employment impact is discussed further in Chapter 8.

CEAI FINDINGS

Employment Estimates

CEAI's estimate of the number of person-years of employment created by the LPW program is presented, by quarter and type of employment, in Table 4-1. Estimated direct (construction industry) employment is shown in Column 1 of Table 4-1. Direct employment was estimated by multiplying projected LPW expenditure streams for each type or project by BLS labor requirements coefficients, which had been adjusted for productivity and price changes over time. Estimated indirect (materials supply industry) employment is shown in Column 2 of Table 4-1. Indirect employment was estimated by multiplying LPW expenditure streams for each type and size of project by the labor requirements coefficients of the inverted Leontieff matrix of the CEAI INFORUM (input/output) model. Adjustments were made for forecast changes in productivity and (in some cases) for the phasing of materials requirements in the production process. Estimated induced employment is shown in Column 3 of Table 4-1. Induced employment was estimated by means of an employment multiplier (the ratio of induced to direct employment) derived from a simulation of the CEAI Macroeconomic Model. This employment multiplier was, in essence, multiplied times the estimate of direct employment to obtain an estimate of induced employment. Estimated total employment, which is shown in Column 4 of Table 4-1, is simply the sum of the other three types of employment, by quarter. These methodologies are discussed in greater detail in Chapter 2.

¹ Cf. Public Law 94-369, Public Works Employment Act of 1976; Section 201.

² George Meany, "Statement before the House Committee on Public Works, on H.R. 11 and Related Measures to Increase Authorization for the Local Public Works Capital Development and Investment Act of 1976," February 1, 1977, p. 2.

FIGURE 4-1
UNEMPLOYMENT RATES FOR THE ECONOMY
AS A WHOLE AND THE CONSTRUCTION
INDUSTRY

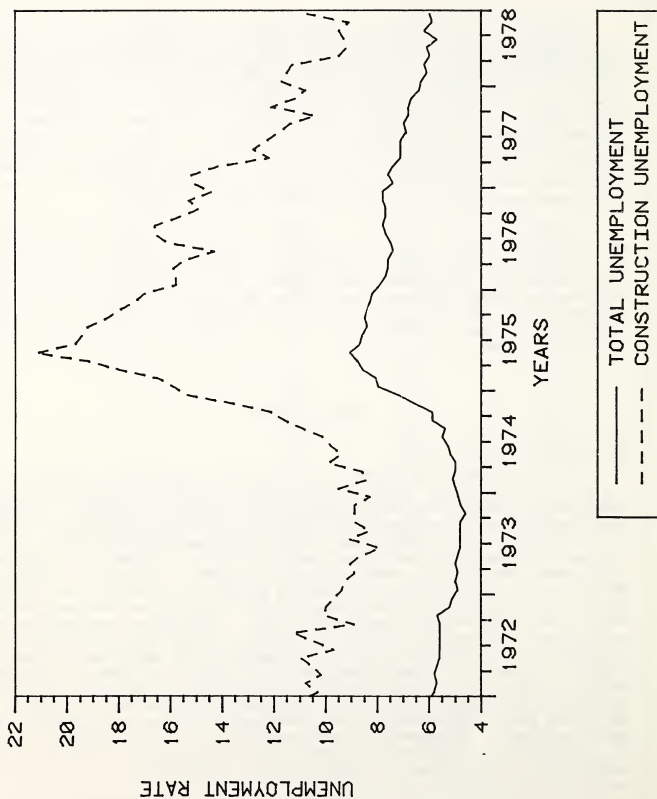


TABLE 4-1
NET EMPLOYMENT ESTIMATES
(Person-Years)

Quarter	Direct Employment	Indirect Employment	Induced Employment	Total Employment
1977.1	868	1,103	984	2,955
1977.2	3,782	4,686	4,234	12,702
1977.3	4,104	5,142	4,624	13,870
1977.4	7,145	8,321	7,716	23,182
1978.1	8,621	9,162	9,026	26,809
1978.2	14,367	14,581	14,473	43,421
1978.3	10,026	9,003	9,515	28,544
1978.4	7,680	7,204	7,440	22,325
1979.1	4,373	4,431	4,411	13,215
1979.2	2,226	2,207	2,211	6,654
1979.3	1,340	1,004	1,171	3,515
1979.4	147	141	143	431
1980.1	-430	-474	-453	-1,357
1980.2	-582	-642	-612	-1,836
1980.3	-735	-925	-832	-2,492
TOTAL	62,932	64,944	64,062	191,938
Person Years Per \$100,000	1.06	a	a	3.23
Cost Per Person Year	\$94,685	^b 46,952	a	\$31,045

a) Not computed separately

b) Cost per person-year for direct and indirect employment

The estimates of all four types of employment shown in Table 4-1 are further adjusted for substitution and crowding out. For substitution a simple multiplicative adjustment was made to all employment estimates to reflect the level of substitution of LPW funds for local funds which was estimated to be twenty percent of LPW expenditures. Crowding out adjustments were based on the degree of crowding out in the (residential) construction industry shown in a Macroeconomic simulation of the LPW program. It was assumed that crowding out of indirect and induced employment was equiproportional to crowding out of direct employment. The methodologies used for substitution and crowding out are discussed in greater detail in Chapter 3.

CEAI's estimates that the LPW program will have created 191,938 person-years of employment. Of that amount, 62,932 person-years is in the construction industry, and 64,994 person-years is in the materials supply industries.³ Slightly over 27 percent of the employment impact occurred in 1977, 63 percent is in 1978, and 12 percent will be in 1979. In 1980 CEAI estimates that crowding out will actually produce a slight net reduction⁴ in employment.⁵ The proportions of construction employment are slightly less in 1977 and slightly more in subsequent years, primarily because certain material expenditures are concentrated in the early phases of construction. The employment is created at an estimated cost of approximately \$95,000 per person-year for the construction industry employment, and \$31,000 per person-year for overall employment (including the induced impact).

As part of its analysis, CEAI estimated LPW employment on the basis of a simulation of the CEAI Macroeconomic Model. The resulting estimates of direct and total employment are shown in Table 4-2. This measure of employment is in persons

³ The industry employment impact estimates are disaggregated further in Chapter 5.

⁴ Because of this phenomenon, the percentages of employment in previous years sum to 102 percent.

⁵ That the net employment impact should be negative for the final quarters of the program is certainly counter-intuitive. This result nevertheless flows logically from the combination of several factors. First, crowding out occurs through indirect as well as direct channels -- i.e. not only does the LPW program hire away resources, but other construction is also reduced by such factors as inflation and rising interest rates. These indirect effects are particularly important when the economy is relatively tight, as during the latter stages of the LPW program. Second, the crowding out effects tend to lag the positive LPW impact. The indirect crowding out in particular tends to build up a cumulative effect which is especially significant because of the length of the program. Third, the LPW expenditures are estimated to taper off to a relatively low level -- especially in the last year of the program's impact. Thus even small crowding out effects resulting from large expenditures in earlier periods can exceed the small positive employment impact of the LPW program in its final stages. Indeed, this is exactly what is estimated to occur: Once crowding out adjustments are made, small negative employment impact does result in the last three quarters.

TABLE 4-2
MACROECONOMIC SIMULATION ESTIMATES
OF EMPLOYMENT
(Persons Employed)

<u>Quarter</u>	<u>Net Direct Employment</u>	<u>Net Total Employment</u>
1977.1	275	275
1977.2	1,158	2,046
1977.3	1,755	4,126
1977.4	3,054	8,126
1978.1	4,665	12,612
1978.2	7,079	17,094
1978.3	6,930	19,402
1978.4	6,836	19,492
1979.1	6,023	17,394
1979.2	4,641	13,094
1979.3	2,763	8,755
1979.4	1,440	6,587
1980.1	2,446	2,205
1980.2	0	0
1980.3	<u>0</u>	<u>0</u>
TOTAL	47,065	131,397

employed per year and is not comparable with CEAI's other estimates.⁶ Nevertheless the simulation estimate -- equal to 75 percent of direct employment estimated by labor requirements -- may serve as a useful lower bound.

Assessment of CEAI Employment Estimates

The single most important factor in an assessment of the CEAI evaluation of LPW employment impacts is the fact that CEAI has made ex ante estimates, not an ex post evaluation. This is a necessary result of the timing of the evaluation. Except for some variables in the Macroeconomic Model simulation, data on the timing of expenditure in 1977 and CEAI's own surveys, no primary data on LPW employment or other impacts were available to CEAI. Even these data covered only about the first 30 percent of LPW expenditures. The necessity of estimation undoubtedly results in a higher potential for error than does ex post measurement.

In making its estimates of employment impact, CEAI has generally had a choice of methodologies or of quantitative estimates within a methodology. CEAI has based its choice of procedure or estimate on: (a) degree of detail; (b) judgmental assessment of accuracy; (c) the comparability of employment estimates; and (d) judgmental assessment of appropriateness to the conditions surrounding the LPW program. CEAI has also made several other adjustments to the estimates of employment impact not found in other estimates. They are:

- Estimated adjustments of labor requirements coefficients for future years
- Adjustments in employment estimates for substitution
- Adjustments in employment estimates for crowding out

The net effect of each of these adjustments was to lower the estimate of net employment.

⁶ The CEAI Macroeconomic Model measures the number of people "employed" (in a National Income Accounts sense) during the quarter. Yet the average LPW job is estimated to be about a month, and construction work is notoriously erratic. Thus it is possible that an LPW worker, who otherwise had only little employment, would be counted as fully employed even if he worked only a few days in the quarter. In this case, the average month of LPW work for each worker would not count as an increase in employment, and the macroeconomic measure of employment would be biased downwards, relative to a measure of person-years. Aside from the possibility of biases, person-years is a preferable measure of employment from the point of view of standardization and comparability with other estimates.

Besides the necessity of using estimation procedures instead of measurement, the most important potential source of error in the results is data limitations. Data were often less complete than was desirable, which led to simplifying assumptions and approximations.⁷ It is not clear, however, that improvement to the results would justify upgrading the data base. Data collection is costly,⁸ can be fraught with problems, and some of the information may be virtually unknowable.⁹ Some data -- especially the BLS labor requirements estimates -- are so widely used that more intensive and extensive research would appear justified.

CEAI believes that the person-year estimates of employment impact are accurate within a margin of 5 to 10 percent. Nevertheless, if there is a systematic error, CEAI is confident that the estimates overstate, rather than understate, the employment impact.¹⁰ The two major alternative measures of employment -- the Macroeconomic Model simulation is about 25 percent lower than CEAI's person-year estimates, and may serve as a lower bound to the estimate of employment impact. Nevertheless, CEAI believes that the downward bias of estimates based directly upon this source is larger than the potential error of CEAI's person-year estimates.

⁷The following are representative examples of the problems: (a) lack of comprehensive data on labor mobility necessitated the assumption that labor did not cross state (or at least regional) boundaries in the LPW program. Fortunately this assumption was substantially born out by CEAI's limited survey; (b) the limited number of construction categories for which BLS labor requirements estimates existed made classification of LPW projects difficult, and sometimes highly judgmental; (c) even with a survey, estimation of the degree of substitution in cases where partial and/or uncertain construction would have occurred in the absence of LPW could only be done on an aggregated, somewhat judgmental basis.

⁸Improvement of the CTS data for relatively non-industrialized states, for example, would have required resurveying those areas. Comparability then might require redoing the entire survey.

⁹It is highly doubtful, for example, that the probability of construction or the exact source of funding for a local project that is scheduled for initiation four or five years in the future can be assessed objectively.

¹⁰Several features of CEAI's procedure may have raised the employment impact estimates: (a) CEAI's estimate of substitution is substantially lower than other estimates (albeit they were made for other programs). If CEAI's estimate of substitution is inaccurate it probably understates substitution and thus overstated employment impact; (b) similarly, to the extent that marginal labor requirements differ from average labor requirements, marginal requirements are often thought to be lower than average requirements. Thus if CEAI's assumption of equal marginal and average labor requirements is incorrect, it is likely to have resulted in an overstatement of labor requirements (and thus employment); (c) CEAI took great pains to avoid understating the impact of the employment multiplier by rounding it up from 2.8 to 3.0. This raised the total employment estimate by 7 percent. In order to reflect the timing of both, average of direct and indirect (the latter being slightly larger) was used as the multiplicand, in the employment multiplier, rather than just direct employment. This raised the total employment by about 1 percent.

Comparison with Other Estimates

There are very few other employment impact estimates for either the LPW program or for other programs that are sufficiently similar to be comparable.¹¹ Most of the studies that do exist, however, suggest that the employment impact is substantially higher than CEAI's estimates. In general, most of the discrepancies appear attributable to these studies' failure to make adjustments for crowding out, substitution, and price and/or productivity changes. Brief specific comparisons with these studies -- which represent most of the available methodological approaches are presented after the discussion of the adjustments made by CEAI.

The Impact of CEAI Adjustments

CEAI's adjustments for price and productivity changes, crowding out, and substitution substantially reduced estimated employment. Specifically:

- CEAI's adjustment for price and productivity changes reduced estimated employment impacts by at least 11 percent of the unadjusted level¹² (11,100 person-years of direct employment, or about 33,500 person-years of total employment).
- CEAI's adjustment for substitution reduced estimated employment impacts by 20 percent of estimated gross adjusted employment (17,730 person-years of direct employment, or 20,625 person-years of total employment).
- CEAI's adjustment for direct crowding-out in the period of the LPW program reduced estimated employment impacts by nearly 9 percent of estimated gross adjusted employment (7,975 person-years of direct employment, or 24,190 person-years of total employment).
- CEAI's simulation of an LPW program beginning in the second quarter of 1974 indicated that construction employment would have been nearly 9 percent (7,880 person-years) higher than adjusted gross employment estimated for the actual program, and total employment would have been over 13 percent (36,200 person-years) higher than that estimated for the actual LPW program.

¹¹All BLS studies, upon which CEAI's estimates of direct employment impact are based, are excluded from this section, since any comparison would simply involve CEAI's adjustment procedures, which were discussed in Chapter 2.

¹²This figure is based on an alternate estimate direct of employment using labor requirements adjusted by the BLS to 1977 for all LPW expenditures. Most other studies use labor requirements adjusted to some earlier year, which makes the discrepancy even larger.

Without netting out the substitution and direct crowding-out effects, CEAI estimated that direct (construction industry) employment impacts would be 88,640 person-years, and total employment impacts would be 270,170 person-years. These employment figures are about 40 percent higher than those shown in Table 4.1. The estimated cost per person-year of employment would then be about 29 percent lower than shown in Table 4.1 (\$67,224 per person-year for direct employment, and \$22,055 per person-year for total employment). Had the problem begun in 1974.2, estimated total employment impacts gross of substitution would have been over 50 percent higher than employment shown in Table 4.1, and the estimated cost of employment would thus have been some 35 percent lower.

Job Cost Estimates

Most of the available estimates of employment impact of public works expenditures summarize their findings in terms of the cost of jobs, or person-years per \$100,000 (which is the reciprocal of cost). These results are summarized, by type of employment, in Table 4-3. In order to facilitate the comparison, CEAI's estimates have been adjusted to be gross of substitution and construction crowding out and to be based exclusively on 1977 price and productivity adjustments.

The Congressional Budget Office¹³ estimated the total employment of injections of public works expenditures, using BLS data as an input for a macroeconomic simulation of the economy.¹⁴ Two estimates are obtained, based on different assumptions about labor intensities of the projects. The resulting impact is estimated to be 6.4 to 8.0 person-years of employment per \$100,000 (as compared with CEAI's estimate of 5.55). The estimates are for 1975, however, and CEAI estimates that adjustment to 1977 price and productivity levels would have lowered the results to 5.31 and 6.40. Moreover, the lower figure is based on "average" labor intensity, while the upper value is set at an extremely high level¹⁵ in order to produce an upper limit. These estimates are thus quite consistent with CEAI's projection of LPW employment generation.

¹³ The exact references for this and the following studies are given in the notes to Table 4-3.

¹⁴ The simulation is not exactly comparable to the LPW program, since a continuous injection is assumed. CEAI has interpreted the longest term (24 months) results as the equivalent of CEAI's estimates. The exact manner of injection of expenditures is not adequately documented, so that no methodological comparison is possible.

¹⁵ The upper limit is derived under the assumption of expenditure on projects with a labor intensity of 0.6. By comparison, materials costs alone averaged about 55 percent of direct LPW expenditures, and were not less than 42 percent for any construction category.

TABLE 4-3
LABOR COST ESTIMATES
(person years per \$100,000)

Type of Employment	CEAI ^a	CEAI 1977 Estimate ^b	C.B.O. ^c	Sulvetta Thompson ^d	Vernez ^e	AFL-CIO ^f
Direct	1.06	1.82	-	2.4	3.34	7.0
Indirect	1.09	1.88	-	-	1.58	
Total	3.23	5.55	6.4-8.0	-		

- a) Best estimate. Taken from Table 4-1.
- b) Based on labor requirements adjusted to 1977 by the BLS figures are gross of substitution and crowding out in the construction industry.
- c) Source: U.S. Congress, Congressional Budget Office, Temporary Measures to Stimulate Employment: An Evaluation of Some Alternatives, Washington, 1975. Estimates are based on 1975 data.
- d) Source: U.S. Department of Commerce, Economic Development Administration, Program Analysis Division, An Evaluation of the Public Works Impact Plan (PWIP), by Anthony J. Sulvetta and Norman L. Thompson. PB-263-098. Springfield, VA: N.T.I.S., 1975. Estimates are based on 1972 data.
- e) Source: George Vernez, et. al., Regional Cycles and Employment Effects of Public Works Investments. R-2052-EDA, Santa Monica: Rand, 1977. Estimates are based on 1974 data.
- f) Source: George Meany, "Statement before the House Committee on Public Works, on H.R. 11 and Related Measures to Increase Authorization for the Local Public Works Capital Development Investment Act of 1976," February 1, 1977.

Sulvetta and Thompson base their estimate of direct employment impacts on a sample of 226 PWIP projects. Their estimate of 2.4 person-years per \$100,000 ¹⁶is based on 1972 data. (For comparison, CEAI's 1977 estimate is 1.82) When adjusted for 1977 price and productivity levels, however, CEAI estimates that the Sulvetta and Thompson value falls to 1.6 person-years per \$100,000, which is also consistent with CEAI's own estimate.

Vernez et. al. base their direct employment impact estimates on BLS data. That the resulting estimate (3.34 person-years per \$100,000) should be so much higher than CEAI's estimate (1.82) is therefore a bit surprising. Over half of Vernez's categories, however, are civil works¹⁷ -- mostly water projects that were excluded from the LPW program. These project types have relatively high labor requirements. If they are excluded, the average for Vernez's employment impact falls to 2.82 jobs per \$100,000. The rest of the discrepancy is explained in terms of changes in productivity and prices between 1974 and 1977.

Vernez's indirect employment estimate (1.58 jobs per \$100,000) is below the CEAI estimate (1.88). Adjusted to 1977 price and productivity levels,¹⁸ CEAI estimates Vernez's indirect employment impact value to be 1.32 jobs per \$100,000. CEAI believes that much of the discrepancy between this value and Vernez's result is due to the use of a partial input/output table in Vernez' analysis. The partial table includes only 13 two-digit manufacturing industries, one mining industry, and the transportation, wholesale, and retail services sectors. Although the omissions of direct materials requirements may be small, the omission of derived demand for labor is likely to be substantially larger.

The AFL-CIO estimates of 7.0 person-years per \$100,000 of direct employment and 3.5 to 7.0 person-years per \$100,000 of indirect employment is high by any standard. The estimate is essentially undocumented, although it is reported to have been "based" on the CBO and BLS studies. Given the available sources, however, such an estimate can only have been made by using quite old data, unadjusted for price or productivity changes, and/or by using values at the top of the estimated ranges. Since documentation is completely lacking, adjustment for comparison is impossible.

¹⁶The estimate is originally made in terms of jobs and converted to person-years at the rate of 0.079 person-years per job.

¹⁷Vernez assumes equal expenditure on 22 project types, 12 of which are public works. CEAI uses just one of these public works categories, primarily as category of miscellaneous outdoor projects.

¹⁸Omission of the 12 civil works categories leaves the employment impact value virtually unchanged.

Employment Multipliers

Estimates of total employment can be compared by analysis of the employment multipliers.¹⁹ CEAI's Macroeconomic Model simulation of the economy produced an employment multiplier of 2.8, which was judgmentally rounded up to 3.0.

Vernez is the only author who explicitly estimates both the direct and total employment impacts necessary to measure an employment multiplier. In this estimate an econometric model, which converts expenditures to physical amounts of employment and materials and uses these as inputs, is simulated for the 1970-71 recession. An employment multiplier of 3.7 is estimated for sewers and one of 3.9 is estimated for public buildings.²⁰ About half of the difference between these estimates and CEAI's LPW estimate appears to be accounted for by differences in the level of crowding out existing in a recession and that existing in the LPW period. CEAI believes that the rest of the discrepancy is attributable to the specifications of Vernez's model. Since it is not a complete macroeconomic model of the economy, it does not appear to capture all of the (negative) feedbacks of expenditure that do exist.

Policy Implications

The primary policy implication of CEAI's findings is that the LPW program is an expensive means of creating employment. A person-year of employment in the construction industry is estimated to cost nearly \$95,000, and overall cost is over \$31,000 per person-year. (Of course, to the extent that the LPW program is designed to meet other goals such as adding to local infrastructure, it is unfair to compare the costs per job directly with the costs of other programs.) Most of the other policy implications pertain to the reasons for this level of cost.

Much of the high cost of job-creation is attributable to the LPW's focus on the construction industry. The industry is not particularly labor intensive, and wages tend to be high.²¹ Both of these factors imply a high cost per person-year of employment. If the goal of a policy is to create construction industry jobs -- as it clearly was -- their high cost must be recognized.

¹⁹ The employment multiplier is defined as the total employment impact, divided by the direct employment impact.

²⁰ An estimate cited by Vernez for comparison results in an employment multiplier of 2.8 for water and waste treatment facilities and 3.3 for educational facilities. See Roger H. Bezdek and Bruce Hannon, "Job Impact of Alternatives to Corps of Engineers Projects," Engineering Issues, October 1973, pp. 521-531. Bezdek and Hannon computed total job estimates. For comparability, Vernez transformed these estimates into employment multipliers. These results tend to confirm CEAI's aggregate estimate of 3.0 rather than Vernez's estimates.

²¹ In part this is due to (and compensates for) the intermittent nature of construction employment. Unionism is also a factor in many areas, and the Davis-Bacon and other program-specific requirements are estimated to have increased costs by 10 percent, and possibly more.

The LPW program's impact was spread out over a longer period of time and occurred later -- both absolutely and relative to the business cycle -- than was originally intended. This lowered the employment impact in two ways: First, construction price and productivity increases continually erode the employment generated.²² Second, crowding out increasingly offset the employment impacts. A shorter, more concentrated program would have had a substantially larger employment impact.

A final policy implication of the above comparisons is the importance of using forecasting in program evaluation. At the time of the debate concerning-- and approval of--the LPW program, the available "state of the art" analysis consisted of *ex post* studies of employment impacts. Even the best and latest of these studies used 1974 or 1975 data. Moreover, some of the studies focused explicitly on recessionary conditions. By contrast the peak impact of the LPW program occurred at least three years after the effective dates of all of the studies and indeed three years after the trough of the recession (March, 1975)

During this period both cyclical and secular changes in many variables and economic relationships acted to reduce the employment impacts of the LPW program to levels substantially below those originally estimated. If the impact estimates upon which policy makers base their decisions are to be accurate, they must consider the expected life of the program and they must include forecasted adjustments for events which are likely to occur during this future period.

²²

Since the general value of the dollars decreased in value over this period, the comparison of the LPW program with other programs having earlier expenditure pattern is inappropriate unless the necessary adjustments are made.

CHAPTER 5: INDUSTRY IMPACTS

It is useful to trace the flows of LPW expenditures through the materials producing sectors of our economy for two reasons. First, approximately 60 percent of all construction expenditures are transmitted directly to the industries which produce materials and provide services for the construction industry. Since the materials producing industries are a significant beneficiary of the LPW program, and no analysis of the program would be complete without an examination of these impacts. Second, in order to examine the inter-regional impacts discussed in Chapter 7, one must first know the flows of funds to the various materials producing industries.

The construction industry, of course, is itself a significant industry. However, the calculation of the impacts upon the construction industry is quite straightforward and was discussed in earlier chapters. The amount of total funding received by the construction industry is the entire \$6 billion of LPW expenditure. The timing of the expenditure pattern is shown in Table 2-2. The amount of construction industry employment generated by the construction activity is shown in Table 4-1.

The Pattern of Industry Impacts

Methodology

The methodology used to identify the industry impacts is described in Chapter 2. Briefly summarized, input/output categories were aggregated into 57 major material supply industries, which are shown in Table 2-3 and Table 5-3. LPW expenditures were aggregated by type of construction expenditure as shown in Table 5-1. The quarterly LPW expenditure flows were then adjusted to reflect differences between the timing of total construction expenditures and the timing of certain materials purchases.¹ These phasing adjustments are shown in Table 5-2.

¹ The time-phasing was developed from information supplied by contractors and material supply trade organizations. The actual adjustment of expenditures was based upon the average size and duration of the projects and was somewhat judgmental, due to the variety in type and scope of projects funded by the LPW program. The mechanics of the adjustment are illustrated as follows: In an industry, such as lumber, which contributed inputs primarily in the first half of a project, an increasing proportion of expenditures in the latter quarters was removed and reallocated to the earlier quarters up to the point where 50 percent of the total funds for that round had been spent.

Table 5-1

CLASSIFICATION OF NEW CONSTRUCTION
CATEGORIES FOR MATERIALS
REQUIREMENTS STUDY

Private Sector

1. Residential Single-Family Dwellings
2. Residential Multi-Family Dwellings
3. Mobile Homes
4. Residential Additions and Alternatives
5. Nonhousekeeping Residential (Hotels, Motels, Dormitories, etc.)
6. Industrial
7. Offices
8. Stores, Restaurants, Garages, Warehouses
9. Religious
10. Education (except Housing)
11. Hospitals
12. Miscellaneous Nonresidential Buildings (including Transportation Terminals)
13. Farm Nonresidential
14. Oil & Gas Exploration and Drilling
15. Railroad
16. Communication
17. Electric Utilities
18. Pipelines and Gas Utilities
19. Miscellaneous Nonbuilding Construction (Bridges, Dams, Playgrounds, Airfields, etc.)

Public Sector*

20. Highways
21. Military
22. Conservation and Development (Parks, Waterways, etc.)
23. Sewer Systems
24. Water Systems

* Note: public education, hospitals, industrial residential and miscellaneous all are assumed to have material requirements identical to the corresponding private sector.

TABLE 5-2
TIMING OF MATERIAL SUPPLY DEMAND FOR BUILDINGS

<u>Supply Industry</u>	<u>Construction Phase</u>
8 Lumber	First 50% of Project
9 Veneer and Plywood	First 50% of Project
10 Mill & Wood Products	Final 50% of Project
21 Structural Clay Products	Final 50% of Project
23 Cement, Concrete, Gypsum	First 40% of Project
24 Other Stone & Clay	30% to 60% of Project
31 Plumbing & Heating Equipment	From 35% to 100% of Project
33 Other Structural Metal	From 20% to 50% of Project

The adjusted expenditures were then injected into the inverted input/output matrix to obtain industry impacts on a quarterly basis. The results, in current dollars, are shown in Table 5-3. Finally, employment estimated, in person-years, were derived using actual and forecasted annual productivity indices.² These estimates are shown in Table 5.4 and are discussed further in Chapter 4.

Direct and Indirect Requirements for Construction

An input/output table contains coefficients measuring the direct purchases required per dollar of activity for each type of construction. The portion of the Chase/INFORUM Model pertaining to construction requirements is presented in Appendix D, Table D-1. However, we must calculate the indirect effects as well as the direct effects, so that we may properly assess the industrial impact of construction spending. Only then, for example, can we estimate the cumulative effect on the steel industry of contractors' demands for such steel-using products as structural steel, valves, air conditioning units, etc.

The analysis of such total economic effects utilizes a matrix closely related to the input/output table. The new matrix, called the Leontief Inverse or the matrix of direct and indirect requirements, quantifies the result of the indefinitely long chain of production caused by any change in the economy's final demand. For example, motor vehicles require tires, which in turn create demand for rubber, steel and polyester. The process becomes an infinite chain because the steel industry also requires parts for its own hauling equipment, which is made by the same motor vehicle industry we started with.³

In Table D-2 we illustrate the portion of the Leontief Inverse from the Chase/INFORUM Model that deals with construction requirements. That is, these are the direct plus indirect requirements for materials per dollar of construction activity. At this point, for example, we can see precisely how much the metals are affected by construction activity. Industrial construction, for instance, requires 9.5¢ of iron and steel per dollar of construction--mostly not as a direct purchase, but because iron and steel is required to manufacture other construction inputs. This 9.5¢ per dollar may be compared with the miniscule 0.7¢ which appears in Table D-1 for the direct requirements of construction for steel items such as nails and reinforcing bars. Similar examples can be found for all of the materials categories.

2

Labor productivity is measured in value of output per person-year. The reciprocal of productivity is therefore a measure of employment per dollar. The higher is the labor productivity in an industry, the lower will be the employment generated per dollar; and the lower the productivity, the higher will be the employment impact per dollar.

3

One of the major differences between the direct construction requirements coefficients (Table D-1) and total requirements coefficient (Table D-2) is the treatment of value added. Value added represents the sum of labor compensation plus the return of capital in the construction industry, rather than material or service inputs. Value added for the construction industry itself averages slightly over 40¢ of every dollar of construction expenditure. Each subsequent expenditure on materials or services in the chain of production generates more value added and more expenditure on materials and services, as described above. Ultimately, the total value becomes one dollar for each dollar of construction expenditure. Because this relation is an identity, value added traditionally is omitted from the inverted input/output matrix.

Results

The aggregate impact of the LPW program on materials and service industries is about \$5.7 billion,⁴ or about 16 times as much as the direct construction requirements. This excess of total over direct impact is due to the double counting which occurs when materials in prior stages of production pass through the chain of production. Since a great deal of variability in materials requirements exists between construction types, the level of impact, and the degree to which indirect effects augmented it, vary greatly from industry to industry. The input/output table impacts represented in Table D-1 and D-2 are summarized below, by industry group.⁵

Fabricated Metal Products (industries 29-38) constitute the materials supply industry group receiving the largest (and most variable) impact per dollar of construction expenditure. Total impact runs as high as 25¢ per dollar spent, and few construction categories use less than 8¢ per dollar. This industry group includes all manner of builders' hardware, heating and plumbing fixtures, fabricated structural steel, metal millwork, fasteners, fencing, valves, pile and fittings. It is therefore not surprising that the impact is highest for industrial and utility construction. Direct construction requirements constitute 80 to 90 percent of the total impact for this group in most cases.

Metals (industries 25-28) are the group industries receiving the next largest impact, with generally between 6¢ and 18¢ impact per dollar spent on construction (although it runs as high as 28¢ per dollar in water systems). In most cases Iron and Steel accounts for the considerable majority of this impact. Direct demand is usually only 10 to 21 percent of the total impact. This is to be expected, since most metal products are intermediate goods, with the final good falling into a category such as Fabricated Metal Products.

Stone, Clay and Glass (industries 3, 20-24) have one of the least variable impacts, with most types of construction producing between 8¢ and 14¢ demand per dollar spent. Several utility construction categories are lower (4-5¢ per dollar) and the impact ranges as high as 23¢ per dollar for sewer systems. Generally, over half of this impact is accounted for by Cement, Concrete and Gypsum. Between 50 and 80 percent of the impact consists of direct construction requirements in most cases.

Machinery (industries 39-49) receives an impact that is generally between 4¢ and 11¢ per dollar of construction. This is a fairly heterogeneous group of industries, and includes some capital equipment in the indirect requirements. Direct requirements account for 60 to 70 percent of the total impact in most cases.

⁴ See Table 5-3. The size of this total impact is a result both of the mix of types of construction undertaken and of the level of value added at each stage of production. That the impact is approximately equal to LPW expenditures is only coincidental, and it reflects the fact that value added averages just under 50 percent of expenditure at all levels of production.

⁵

The impact on each industry group is obtained by summing the coefficients for each construction category (column) in Table D-2 over the material supply industries (rows) contained in that group.

Lumber and Wood Products (industries 8-12) have a great variability of impact. For single-family dwellings, residential additions and alterations, and farm construction the impact is 25¢ to 28¢ per dollar of expenditure. For all other types of construction it is 11¢ per dollar of expenditure or less. Direct construction requirements generally account for slightly over 50 percent of the total impact, although this share is much less in some cases.

Services (industries 53-57) constitute the group receiving the largest stimulus from construction--larger than any of the manufacturing industry groups. The impact ranges from 30¢ to 45¢ per dollar of construction expenditure. In most cases direct construction requirements account for 40 to 50 percent of this impact. The size of this impact reflects the fact that the input/output table is in terms of producer prices. Thus all of the trade, transportation, and other business margins have been stripped from the input/output coefficient of each of the materials industries and included in the appropriate service industry. Moreover, equipment rental, which is a significant part of construction costs, is included in Business Services. Some type of services, of course, is involved at each stage of production and distribution of all materials.

The impacts actually generated by the LPW program are summarized in the last column of Table 5-3. Shares of impact by industry group are summarized in Table 5-5. The overall impact on Lumber & Wood Products is somewhat lower than the input/output coefficients of Table D-1 and Table D-2 would suggest. This is primarily due to low LPW funding for construction (e.g. frame buildings) that uses these materials heavily.

Table 5-3 also shows the estimated timing of the expenditure impacts, by quarter, which reflects the phasing adjustment of expenditure. The overall effect of these adjustments is a slight forward weighting of the expenditure pattern in the early quarters of Round I and more particularly Round II of the LPW program. This adjustment has a substantial effect on some industries, although the aggregate effect is not great because early phasing of purchases of some materials was offset by late phasing of purchases of others⁶ and because Round II started three quarters later than Round I.

Industry impacts in terms of employment are shown in Table 5-4⁷. The shares of the employment impacts of the major industry groups are shown in

⁶ In 1977 one of the most heavily affected quarters in the materials sector impact is \$78.8 million, or 108 percent of the estimated LPW expenditure for that quarter.

⁷ Because of limitations on the availability of productivity indices used to create Table 5-4 both the industries and the time periods are more aggregated in Table 5-4 than they are in Table 5-3. The industry groups discussed above are defined, in terms of Table 5-4, as follows: Lumber & Wood Products consists of industries 6-9. Stone, Clay & Glass consists of industries 16-17 plus 30 percent of industry 2. Metals consists of industries 18-19. Fabricated Metal Products consists of industries 20-23. Machines consists of industries 24-32. Services consists of industries 36-39.

TABLE 5-3

LPW IMPACT ON INDUSTRIES, BY QUARTER
(THOUSANDS OF CURRENT DOLLARS)

	1977.1	1977.2	1977.3	1977.4	1978.1	1978.2	1978.3	1978.4	1979.1	1979.2	1979.3	1979.4	1980.1	1980.2	1980.3	TOTAL
MATERIAL SUPPLIES	611.8	2501.2	2719.2	4314.9	5982.3	9065.9	6043.8	4979.0	3707.9	2137.8	1179.7	671.2	313.8	166.5	51.2	44492.3
1 AGRIC. CEREALS	183.9	541.0	800.8	1419.9	2052.1	3026.9	2043.8	1694.9	1209.9	747.5	393.9	219.9	109.9	54.9	11.9	95222.1
2 AGRIC. SERVICES	183.9	541.0	800.8	1419.9	2052.1	3026.9	2043.8	1694.9	1209.9	747.5	393.9	219.9	109.9	54.9	11.9	95222.1
3 AGRIC. SERVICES	183.9	541.0	800.8	1419.9	2052.1	3026.9	2043.8	1694.9	1209.9	747.5	393.9	219.9	109.9	54.9	11.9	95222.1
4 OTHER MINING	246.4	1004.4	1095.2	1765.6	2011.3	3095.1	2073.8	1703.9	1233.7	707.1	393.9	219.9	109.9	54.9	11.9	95222.1
5 FOOD PRODUCTS	426.7	1710.3	122.3	189.0	249.4	3710.0	747.5	200.3	145.1	84.6	45.3	25.2	12.1	6.1	6.1	1187.4
6 OTHER TEXTILES	426.7	1710.3	122.3	189.0	249.4	3710.0	747.5	200.3	145.1	84.6	45.3	25.2	12.1	6.1	6.1	1187.4
7 OTHER TEXTILES	426.7	1710.3	122.3	189.0	249.4	3710.0	747.5	200.3	145.1	84.6	45.3	25.2	12.1	6.1	6.1	1187.4
8 LUMBER	1429.1	4742.0	6015.3	3163.4	4268.8	6735.5	481.6	354.5	284.8	1501.3	925.9	464.3	213.7	113.2	38.9	32155.2
9 OTHER LUMBER	377.5	2593.6	3292.2	4971.5	6067.0	9560.3	4330.0	1793.9	1233.7	707.1	393.9	219.9	109.9	54.9	11.9	95222.1
10 WOOD-PROD. PROD.	377.5	2593.6	3292.2	4971.5	6067.0	9560.3	4330.0	1793.9	1233.7	707.1	393.9	219.9	109.9	54.9	11.9	95222.1
11 FURNITURE	1025.5	4394.5	4808.9	7659.2	10254.1	15060.8	8564.6	6403.9	4603.9	3662.1	2305.1	1414.5	597.4	280.5	37.7	77101.0
12 PAINTS	1693.3	6913.2	7505.9	1418.6	14498.6	17174.4	4881.1	3864.6	2848.4	1641.2	905.2	516.8	225.5	127.1	43.7	34181.3
13 CHEM. PROD.	1942.3	7864.8	8511.3	14675.1	16517.1	25722.4	17536.8	12558.2	12558.2	1719.2	3302.6	1758.4	827.7	529.3	181.0	123262.2
14 PETROLEUM	329.1	1186.6	1460.6	4290.0	5979.1	9865.8	6349.3	3685.6	3788.1	221.7	120.9	694.2	451.8	165.7	51.0	45176.2
15 RUBBER, PLAST.	910.0	3727.0	4074.3	6183.0	8423.6	13408.2	7007.1	5218.9	5218.9	2916.3	1644.4	365.7	158.1	22.6	37.1	25520.8
16 GLASS	393.4	1615.9	1784.7	116.6	183.3	1268.5	198.3	154.6	113.8	64.9	36.0	20.2	9.5	4.9	1.7	1384.2
17 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
18 CEMENT, CONC., G.P.	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
19 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
20 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
21 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
22 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
23 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
24 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
25 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
26 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
27 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
28 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
29 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
30 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
31 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
32 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
33 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
34 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
35 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
36 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
37 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
38 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
39 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
40 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
41 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
42 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
43 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
44 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
45 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
46 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
47 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
48 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
49 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
50 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
51 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
52 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
53 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
54 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
55 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
56 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
57 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
58 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
59 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
60 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
61 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
62 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
63 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5
64 OTHER CEMENT	563.7	2382.5	2594.5	4042.8	4554.9	5592.6	3719.7	3305.8	4006.2	2242.5	1226.6	415.5	191.5	103.6	35.6	27426.5

TABLE 5-4
INDIRECT EMPLOYMENT, BY INDUSTRY
(person years^a)

	1977	1978	1979	1980	TOTAL
1. Agriculture	253.3	497.3	142.5	8.7	901.8
2. Mining	923.0	2280.3	600.5	37.0	3840.8
3. Food Products	30.4	70.9	18.9	1.2	121.3
4. Floor Coverings	5.3	11.0	2.8	.2	19.3
5. Textiles & Apparel	156.4	359.9	94.4	6.0	616.7
6. Lumber	267.0	494.0	108.4	8.7	878.2
7. Wood Products	379.0	932.2	291.5	17.7	1620.4
8. Furniture	171.0	390.4	117.1	7.9	686.4
9. Paper Products	285.3	679.3	182.3	11.7	1158.6
10. Paints	75.2	172.2	45.4	2.8	295.6
11. Chemical Products	229.5	537.3	137.7	8.6	913.1
12. Petroleum Products	77.9	195.6	49.2	2.8	325.5
13. Rubber Products	77.7	218.3	52.5	3.3	351.8
14. Plastic Products	215.9	498.8	130.1	8.5	853.3
15. Leather Products	6.9	16.8	4.6	.3	28.6
16. Glass	113.4	260.2	69.8	4.7	448.1
17. Cement & Clay Products	2291.3	4778.5	1120.0	75.3	8265.1
18. Iron and Steel	1202.4	2599.6	647.5	43.2	4492.7
19. Non-Ferrous Metals	486.9	1116.5	290.9	18.8	1913.1
20. Fabricated Metal	387.6	839.4	217.0	14.6	1458.8
21. Plumbing & Heating Eq.	141.0	335.8	11.1	6.3	494.2
22. Structural Metal Products	1885.9	4221.3	857.2	65.0	7029.4
23. Metal Stampings	243.3	572.9	146.9	9.5	972.6
24. Engines and Turbines	25.2	68.2	15.6	.8	109.9
25. Const, Mine, Mater Hndlg Eq	230.0	525.1	141.4	9.2	905.8
26. Misc. Non-elec Mach	297.6	682.0	175.8	11.1	1166.5
27. Serv. Indust. Mach.	127.7	285.1	79.8	5.3	497.9
28. Transf & Switch	183.3	414.4	110.4	7.5	715.6
29. Appliances	31.1	69.0	19.3	1.3	120.7
30. Light & Wiring Eq.	323.3	722.9	196.8	13.3	1256.3
31. Communication Eq.	29.6	63.7	19.0	1.1	113.4
32. Elec Mach, NEC	177.6	410.5	110.4	7.0	705.5
33. Transp. Commodities	50.0	112.6	28.2	1.7	192.5
34. Instruments	166.6	354.5	96.0	6.3	623.4
35. Misc. Manufacturing	373.4	836.5	218.3	13.8	1442.0
36. Transp. Servs.	1533.7	3639.8	933.9	56.7	6164.1
37. Wholesale & Retail Trade	5429.1	11848.6	3006.5	193.5	20477.7
38. Business & Legal Services	4284.8	6621.5	1708.7	109.8	12724.8
39. Other Services, NEC	1692.4	3831.2	992.5	62.9	6579.0
TOTALS:	24861.3	52564.1	13191.1	863.9	91480.4

a)Unadjusted for Substitution and Crowding Out

Table 5-5, where they are compared with the shares of expenditure impact. The two major differences are in Services and Metals. The employment share of services is just over 50 percent of all indirect LPW employment--a third larger than Services' expenditure share. The reason for this is relatively low productivity in the service sector. Metals, by contrast, receives only 7 percent of the employment impact--or 30 percent of its share of expenditure impact. This is due to high productivity in that sector.

Cyclical Characteristics of the Materials Supply Industries

An important policy issue is the extent to which the LPW program relieved the cyclic distress of industries related to construction. It is first necessary, however, to ascertain the degree of cyclic sensitivity of these industries. This involves the timing and volatility of the cyclical movement and the degree of distress suffered by these industries.

Timing and Amplitude of Industrial Cycles

The timing and amplitude of cycles of individual industries were measured using the Federal Reserve Board's indices of industrial production. Definitions of the construction related industries on which these indices are based are given in Table 5-6. The individual industry indices were compared to the four most recent NBER reference cycles, which are shown in Figure 5-1 and are defined as follows:⁸

<u>Cycle</u>	<u>Contractionary Period</u>	
	<u>Peak</u>	<u>Trough</u>
I.	August 1957	April 1958
II.	April 1960	February 1961
III.	December 1969	November 1970
IV.	November 1973	March 1975

The timing of industry cycles is summarized in Table 5-7 in terms of the number of months that the turning points of the industrial production indices lag (lead) the NBER reference cycles. Although there is considerable variation among industries, there are significant differences between the cycles of construction related industries and the movement of overall economic activity. The industrial production indices tend to lead the NBER reference cycles at both the peak and trough, although the trough leads are both smaller and less prevalent. The peak lead is as much as four quarters for many industries in Cycle I. In both peak and trough, however, the turning points of the industrial production indices show a tendency to become more coincident with the NBER reference peaks and troughs in Cycles III and IV than in Cycles I and II.

Peak and trough values of the industrial production indices and percent changes during recoveries and recessions are shown in Table 5-8. The results show a considerable variety of amplitudes of cyclic movement -- both absolutely and in

8

The cycles are defined as beginning with the recession (i.e., with the peak). Implicitly the cycle continues until the next peak, although that peak is considered part of the next cycle.

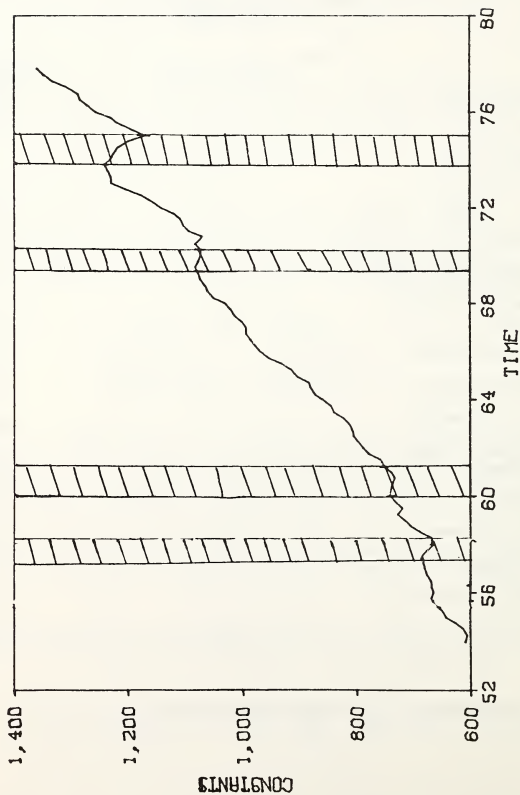
TABLE 5-5
SHARES OF INDIRECT LPW IMPACT
BY INDUSTRY GROUP

<u>Industry Group</u>	<u>Share of Expenditure Impact (%)^a</u>	<u>Share of Employment Impact (%)^a</u>
Agriculture	1.0	0.9
Mining (except Stone & Clay)	2.7	2.6
Food Products	0.3	0.1
Textiles	0.6	0.7
Lumber & Wood Products	5.1	4.7
Chemicals (including Paints)	2.8	1.3
Petroleum Products	3.5	0.4
Rubber Products	0.5	0.4
Plastic Products	1.1	0.9
Stone, Clay & Glass Products	11.8	11.1
Metals	10.5	7.0
Fabricated Metal	13.9	10.9
Machinery	6.5	6.1
Other Manufacturing	2.1	2.5
Services	37.5	50.2

a) Percentages do not sum to 100 due to rounding.

FIGURE 5-1

CONSTANT DOLLAR GNP SHOWING NBER REFERENCE CYCLES



QUARTERLY DATA

GNP

TABLE 5-6
CONSTRUCTION RELATED INDUSTRIAL PRODUCTION INDICES

<u>INDUSTRY NAME</u>	<u>SIC CODE</u>
CARPETING	227
LOGGING AND LUMBER	241, 242
LUMBER PRODUCTS	243, 244, 249
HOUSEHOLD FURNITURE	251
BUILDING PAPER AND BOARD	266
PAINTS	285
PETROLEUM REFINING	291, 299
PLASTICS PRODUCTS NEC	307
CEMENT	324
STRUCTURAL CLAY PRODUCTS	325
CONCRETE, MISCELLANEOUS CLAY MANUFACTURING	326, 327
COPPER	3331
ALUMINUM	3334
NONFERROUS MILL PRODUCTS	335
STEEL MILL PRODUCTS	331, 332
HARDWARE, PLUMBING, STRUCTURE METALS	342, 343, 344
OFFICE, SERVICE AND MISCELLANEOUS	357, 358, 359
CONSTRUCTION AND ALLIED EQUIPMENT	353
SPECIFIC AND GENERAL INDUSTRIAL EQUIPMENT	355, 356
MAJOR ELECTRIC EQUIPMENT AND PARTS	361, 362
HOUSEHOLD APPLIANCES	363
MISCELLANEOUS APPLIANCES	3634, 3635, 3636, 3639
EQUIPMENT, INSTRUMENTS AND PARTS	381, 382, 383, 384

TABLE 5-7
TIMING OF INDUSTRY CYCLES

Industry	Peak Lags ^a				Trough Lags ^a			
	I (8/57)	II (4/60)	III (12/69)	IV (11/73)	I (4/58)	II (2/61)	III (11/70)	IV (3/75)
Carpeting	-11	-9	b	-6	-6	-3	-11	-2
Logging and Lumber	-11	-4	-1	-2	-4	-2	-5	-2
Lumber Products	12	-11	-12	5	0	-2	-9	-3
Household Furniture	0	-9	-11	0	0	-1	-3	2
Build. Paper & Board	11	-12	-12	0	-1	0	-8	-2
Paints	-9	-3	-9	-11	0	3	-10	-3
Petroleum Refining	-3	10	b	-5	-11	-12	-6	b
Plastics Prod. NEC	11	b	b	8	-11	-12	-12	0
Cement	0	-12	0	-10	-2	-11	-10	0
Struct. Clay Products	b	-4	-10	-3	-7	0	-10	0
Concrete, Misc. Clay MFR	-6	-10	-9	5	0	-2	-6	3
Copper	-12	5	0	-4	2	b	8	-7
Aluminum	-10	2	12	9	3	2	12	3
Nonferrous Mill Prod.	-11	-8	0	0	-1	-2	8	0
Steel Mill Products	-11	-10	-1	1	0	0	9	4
Hdwe, Plumb., Struc. Met	1	-10	-3	9	0	0	0	3
Office, Serv., & Misc.	-6	3	-4	4	-2	1	6	1
Constr. & Allied Equip.	-8	-10	-6	11	7	-2	-2	1
Spec. & Genl Ind. Eq.	b	-1	8	9	3	-2	-6	b
Major Elect. Eq. & Parts	-10	-1	-3	9	2	-4	8	0
Household Appliances	-8	-8	7	-2	0	-5	-12	0
Misc. Appliances	-11	2	7	-2	6	-2	-12	0
Equipment Insr & Parts	-4	-1	-2	9	1	-2	5	0

a) Measured in months that the industrial production index lags the NBER reference peak (trough). A negative value indicates that the index leads the NBER reference peak (trough).

b) No maximum (minimum) value of the industrial production index occurred within 12 months of the NBER reference peak (trough).

TABLE 5-8
AMPLITUDE OF INDUSTRIAL CYCLES

Industry	Cycle	Peak Values ^a				Trough Values ^a				Pct Change Trough-Peak				I II III IV			
		I	II	I-I	IV	I	II	III	IV	I-II	III-IV	II-III	b	I	II	III	IV
Carpeting	40	50	b	b	200	31	41	125	139	60	60	b	b	-21	-19	b	-31
Lumber Products	96	97	113	121	121	73	75	100	83	33	20	50	20	-24	-22	-11	-31
Household Furniture	62	75	115	138	55	63	104	105	37	33	33	75	33	-11	-16	-6	-24
Auto. Paper & Board	76	182	115	150	86	98	105	107	75	25	41	66	41	-14	-37	-18	-42
Petroleum Refining	96	80	117	125	56	62	101	101	43	74	24	74	24	-14	-16	-14	-19
Plastics Prod. NEC	78	81	b	131	67	75	111	b	b	20	18	b	b	-9	-7	b	b
Cement	25	b	b	274	22	31	149	189	b	20	18	b	b	-27	-26	-13	-33
Struct. Clay Products	89	96	115	124	75	81	98	83	35	32	26	b	b	-16	-12	-7	-43
Ceramics, Misc. Clay Mfg.	78	83	111	141	66	73	103	108	26	51	37	51	37	-32	-18	-7	-27
Aluminum	126	144	183	172	86	b	49	93	68	b	253	b	b	-22	-19	-15	-51
Nonferrous M11 Prod.	53	64	124	152	42	54	117	72	50	130	50	130	50	-22	-19	-15	-51
Steel M11 Products	61	173	128	163	45	59	102	83	121	125	113	125	113	-53	-50	-50	-37
Chemical & Allied Equip.	71	73	108	138	61	64	103	116	20	69	34	69	34	-15	-12	-10	-26
Office Equip. & Misc.	44	49	130	182	37	46	116	143	33	180	57	180	57	-17	-27	-12	-17
Constr. & Allied Equip.	77	77	109	147	52	57	96	122	50	92	42	92	42	-13	-11	-10	b
Spec. & Genl. Ind. Eq.	b	65	115	125	45	57	96	101	32	98	49	98	49	-27	-14	-29	-29
Maj. or Elect. Eq. & Parts	b	66	127	165	44	53	90	99	58	138	83	138	83	-24	-24	-19	-33
Machinery Appliances	58	70	116	147	49	51	106	115	25	153	61	153	61	-14	-14	-14	-14
Misc. Equip. & Parts	57	61	130	171	49	51	106	115	25	153	61	153	61	-14	-14	-14	-14
Equipment Instr. & Parts	61	73	115	147	55	64	103	120	32	80	43	80	43	-10	-12	-11	-18

a) Value of Federal Reserve Board Industrial production index. (1967=100)

b) No maximum (minimum) value of the Industrial production index occurred within 12 months of the NBER reference peak (trough)

TABLE 5-9

CONSTRUCTION ACTIVITY CYCLE: PEAK, MARCH 1966--TROUGH, MARCH 1967

	PEAK LAGS ^a	TROUGH LAGS ^a	PEAK VALUES ^b	TROUGH VALUES ^b	PCT CHANGE PEAK-TROUGH
Carpeting	c	-10	c	87	c
Logging and Lumber	-2	5	108	96	-11
Lumber Products	1	-3	104	91	-13
Household Furniture	5	4	187	96	-11
Building Paper & Board	2	1	112	91	-18
Paints	-2	-1	105	94	-10
Petroleum Refining	c	-9	c	95	c
Plastics Products NEC	c	-11	c	82	c
Cement	-3	0	118	88	-25
Structural Clay Products	0	1	110	95	-13
Concrete/Misc. Clay MFR	-2	1	102	94	-8
Copper	10	10	173	17	-90
Aluminum	c	c	c	c	c
Nonferrous Mill Prod	3	9	120	87	-27
Steel Mill Products	7	3	120	91	-24
Hdwe, Plumb, Struct, Met	10	-11	100	95	-6
Office, Serv, and Misc.	9	c	101	c	c
Construction and Allied Eq	9	7	107	91	-15
Spec. and Gnl Ind Eq	6	4	105	99	-6
Major Elect, Eq, and Pts.	6	6	105	96	-9
Household Appliances	7	0	107	90	-16
Misc. Appliances	7	0	106	95	-10
Equipment Instr. and Pts.	10	-10	99	90	-9

a) Measured in months that the industrial production index lags the NEBER reference (trough). A negative value indicates that the index leads the NEBER reference peak (trough).

b) Value of Federal Reserve Board Industrial Production index (1967=100).

c) No maximum (minimum) value of the industrial production index occurred within 12 months of the NEBER reference peak (trough).

the relative ranking of industries--from cycle to cycle.⁹ Taking the cycles as a whole, however, metals in general, and steel mill products in particular, show far the greatest volatility. Cement, lumber, construction equipment, and appliances also have relatively large fluctuations. There is also a general tendency (except for steel mill products and construction equipment) for the recession of Cycle IV to be substantially more severe than previous declines in production.

The Influence of Construction

The ability of a program such as LPW to stimulate a material supply industry depends in large part on the importance of construction as a market for that industry. The primary difficulty is that an industry may have many non-construction uses for its output. Metals are a major example of this,¹⁰ but even lumber, which is especially strongly influenced by construction, has the steady influence of relatively stable demand for paper products.

The question of the influence of construction--and the entire issue of volatility--is also complicated by the fact that some demands especially for building materials and equipment, are subject to substantial short-term inventory fluctuations.

There are two cases that show the effects of a cycle in construction activity relatively clearly. The first is the recession in Cycle IV, where the downturn in construction coincided fairly exactly with the movement of the general economy. The downturns for construction related industries in Cycle IV are generally more severe than in other cycles. The fall in the industrial production indices for Lumber & Wood Products, Stone, Clay & Glass, and many Machinery categories (including appliances) are 50 to 100 percent larger than occurred in previous recessions. Metals, however, are not especially adversely affected.

The second case occurred during 1966-1967. The cycle in construction activity which resulted from the 1966 "credit crunch" was much greater than in other components of final demand. There was no NBER reference cycle during this period, and income rose through the construction cycle. Thus the movements in material supply industrial production indices can be interpreted as reflecting primarily the influence of construction. Table 5-9 (which can be interpreted analogously to Tables 5-7 and 5-8 except that the construction peak and trough are used instead

⁹ The size of the expansion between Cycle II and Cycle III is primarily due to the great length of this recovery.

¹⁰ The metals industries face several volatile markets, of which construction is only one. For the iron and steel industry, for example, both automotive products and machinery are major markets. Both of these downstream markets show substantial volatility, which can cause major swings in the production and sales of steel. Copper producers are in a similar position. Furthermore, since copper is a world-wide commodity, this industry is subject to variation from both the supply and demand side. Aluminum tends to be somewhat more stable, since it is less dependent on the automotive market than steel, and because the single largest market for the aluminum industry--containers and packaging--is relatively stable.

of an NBER reference peak and trough) shows these effects. Most of the construction related industries also turn down, and do so in the lagged manner that one would expect. In most cases, the percent declines in industrial production indices, in fact, are remarkably similar to the subsequent recession in Cycle III. Metals, however, are relatively unaffected by the construction cycle. Concrete falls relatively sharply, reflecting an especially great importance of construction to that industry. Appliances, office equipment, and carpets turn down relatively little or not at all, which reflects the fact that the income (which did not decline) is at least as important a factor in demand for these products as is construction activity.

The above analysis suggests that metals are affected by construction activity only slightly. Stone, Clay & Glass--especially concrete--are very substantially affected. For the type of construction downturn which occurred in 1966-67 - a collapse in single family home construction - lumber and wood products were also substantially affected. Fabricated Metal Products and Machinery are only spottily affected by construction activity.

Measures of Industry Distress

A convenient measure of cyclical distress of an industry is size of fluctuations in output--especially the downturns. The difficulty with this measure is that some industries (e.g., lumber or steel) are chronically volatile, and they may have adjusted to this pattern. The fundamental question is whether or not high degrees of cyclicity are compensated for by higher rates of return.

In order to test this possibility, CEAI calculated the average rate of¹¹ return over the past 20 years for a selection of 21 manufacturing industries. Upon comparing the rankings of the mean rates of return with the relative cyclicity of industries, CEAI found no reason to expect the average of return over the long term to be any higher in cyclical industries than in acyclical industries. It does appear to be the case that the amplitude of movement of the rate of return is larger among cyclical industries than among acyclical industries, but this only confirms the use of fluctuations in output as a measure of cyclical distress.

The measure of cyclical distress of an industry that is used in the subsequent analysis is the decline in output (shipments) from the previous peak. This

¹¹ The calculations were based on data on return on book value drawn from industry composites constructed by Standard and Poors. Such data are based originally on financial statements of companies, which introduces a wide margin of error into industry rate of return analysis. The difficulty with this type of analysis is that the companies are not confined to one industry, and the stated primary product of a company may not have a dominant influence on the rate of return.

can be measured in absolute or percentage terms. The distress of construction related industries at the time of a cyclic trough is shown in the last portion of Table 5-8 and the last column of Table 5-9. The cumulative level of industrial cyclical distress at two-quarter intervals was simulated for the last two recessions under the assumption of the absence of counter-cyclical policy, and is presented in Appendix E.

The Size of the LPW Program Relative to the Industry Impact

Two comparisons of the stimulus of the LPW program with industry distress were made. First the LPW stimulus for the peak year of the program, 1978, was compared to the total industry distress at the trough of the 1974 recession.¹² Second, the total LPW stimulus was compared with the amount of stimulus that would have been required to overcome 20 percent of industry distress.

Table 5-10 presents the estimated value of shipments induced by the LPW program, by industry.¹³ In Table 5-11 the value of shipments at, and date of, the peak and trough of the last recession are presented. Industry distress is shown in absolute terms and as a percent of the previous peak. The 1978 LPW stimulus is also presented both in absolute form and as a percent of industry distress. Table 5-12 compares the total LPW stimulus--both actual and as a percent of industry distress--with industry distress and with a potential target of 20 percent of industry distress, which is used as a benchmark of "measurable" impact.

The peak year impact of the LPW program on materials supply industries was small. As shown in Table 5-11, the impact ranges from 0.02 percent of distress to 10.21 percent of distress, with an average impact of 2.4¹⁴ percent of industry distress. Only five industries¹⁵ receive impacts greater than 5 percent of industry distress.

¹² The materials industry stimulus for 1978 is estimated to be 54 percent of the total LPW program materials industry stimulus. A single year's stimulus is used for comparison with distress because all shipments data are on an annual basis.

¹³ The data in this table are based on Table 5-3. The industry categories have been aggregated to the 39 industries used in Table 5-4. Expenditures have been aggregated from a quarterly basis to an annual basis, and have been transformed from current dollars to constant (1972) dollars. All values in the following tables are also on an annual basis in 1972 dollars.

¹⁴ This excludes 29 percent of 1978 LPW impacts, which fell on industries that did not experience measurable distress.

¹⁵ The greatest impact is received by Structural Metal Products. Other industries with impacts of over 5 percent are Electrical Machinery, NEC; Plastic Products; Cement & Clay Products; and Construction, Mine & Material Handling Equipment.

TABLE 5-10
LPW IMPACTS ON INDUSTRY OUTPUTS (SHIPMENTS)
(Thousands of 1972 Dollars)

Material Suppliers	1977	1978	1979	1980
1. Agriculture	8865.3	20886.3	5849.0	382.3
2. Mining	32304.9	80950.3	21317.4	1296.1
3. Food Products	2672.4	6391.6	1767.7	115.8
4. Floor Coverings	277.9	582.9	151.9	9.3
5. Textiles & Apparel	5410.0	13533.1	3736.1	245.4
6. Lumber	13083.7	25195.2	5746.9	471.2
7. Wood Products	14592.2	34490.0	10640.5	654.9
8. Furniture	4616.8	1054.2	3162.2	220.5
9. Paper Products	10912.5	26663.0	7383.4	474.3
10. Paints	14738.7	11020.1	2996.3	189.8
11. Chemical Products	16215.6	40031.5	10903.3	703.3
12. Petroleum Products	17610.8	46360.1	12154.8	699.9
13. Rubber Products	3185.7	8843.4	2233.0	136.8
14. Plastic Products	8637.6	20451.7	5592.6	373.7
15. Leather Products	235.0	580.9	161.4	10.8
16. Glass	3856.3	8847.5	2444.1	162.7
17. Cement & Clay Products	82488.1	176903.8	43679.7	3012.2
18. Iron and Steel	57717.2	129978.5	33668.9	2244.5
19. Non-Ferrous Metals	36033.6	84855.3	22978.1	1524.6
20. Fabricated Metals	23641.6	52041.6	13855.9	940.3
21. Plumbing & Heating Equip.	4512.6	10745.5	3666.9	214.1
22. Structural Metal Products	64119.5	156188.8	33432.2	2598.3
23. Metal Stampings	9489.0	22343.6	6024.7	388.8
24. Engines and Turbines	1665.4	4777.6	1172.9	64.3
25. Const., Mine, Mater Handlg Eq.	9200.7	22052.6	6223.4	406.5
26. Misc. Non-elec Mach	10864.1	26120.0	7085.1	461.6
27. Serv. Indust. Mach.	7915.0	18530.7	5349.9	363.2
28. Transf & Switch	5499.6	12845.4	3533.8	238.7
29. Appliances	1369.7	3171.9	926.1	64.1
30. Light & Wiring Equip.	9698.2	21687.2	6101.6	413.3
31. Communication Equip.	1156.3	2546.8	800.1	46.1
32. Elec Mach, NEC	6483.6	15085.2	4138.7	272.2
33. Transp. Commodities	2628.3	6168.6	1653.8	104.3
34. Instruments	5289.1	11521.1	3265.4	218.4
35. Misc. Manufacturing	13629.2	31786.6	8512.9	546.8
36. Transp. Services	50229.9	123754.8	33152.3	2069.1
37. Wholesale & Retail Trade	86865.6	201426.4	54117.6	3482.6
38. Business & Legal Services	68690.3	158916.6	42710.4	2743.8
39. Other Services, NEC	135389.0	316840.6	84660.9	5410.4
TOTALS	851790.9	1676071.0	516987.9	33975.0

Program Total: 3,078,824.8a

a) Equivalent to \$5,714,065 thousand in current dollars during the LPW program.

TABLE 5-11 - DISTRESS AND STIMULUS
(Millions of 1972 dollars)

	Peak	Year	Trough	Year	Distress	Distress as % of Peak	1978 LPW Stimulus	Stimulus as % of Distress
1. Agriculture	95287.4	(73)	92615.6	(74)	2672	2.8	20.9	.78
2. Mining	30827.2	(72)	26834.3	(77)	3993	12.4	80.9	2.00
3. Food Products	a		a		a	a	6.4	a
4. Textiles & Apparel	3166.17	(73)	2455.58	(75)	711	22.4	6	.08
5. Lumber	60427.6	(73)	54471.4	(75)	5956	9.9	13.5	.23
6. Wood Products	12862.8	(73)	11550.5	(75)	1312	10.1	25.2	1.92
7. Furniture	10199.2	(73)	8590.53	(75)	1509	15.8	34.5	2.14
8. Paper Products	13238.2	(73)	11139.8	(75)	2098	15.8	1.0	.05
9. Paints	61222.5	(73)	59368.4	(75)	1854	3.0	26.7	1.44
10. Chemical Products	3986.86	(73)	3551.55	(75)	435	11.0	11.0	2.53
11. Petroleum Products	61786.2	(74)	57067.6	(75)	4719	7.6	40.0	.85
12. Rubber Products	43974.9	(73)	40910.3	(75)	3065	7.0	46.4	1.51
13. Plastic Products	10860.1	(73)	9612.54	(74)	1248	11.5	8.8	.70
14. Leather Products	11842.5	(73)	11549.4	(75)	293	2.5	20.4	6.96
15. Glass	5949.95	(74)	5560.59	(78)	389	6.5	6	.15
16. Cement & Clay Products	5031.87	(73)	5706.52	(75)	325	5.4	8.8	2.71
17. Iron and Steel	15440.8	(73)	12659.0	(75)	2781	18.0	176.8	6.36
18. Non-Ferrous Metals	39284.0	(73)	34970.6	(75)	4313	11.0	130.0	3.01
19. Fabricating Metal	26379.7	(73)	22741.8	(75)	3638	13.8	84.8	2.33
20. Plumbing & Heating Eq.	22829.3	(73)	21261.3	(75)	1568	6.9	52.0	3.32
21. Structural Metal Products	2355.41	(72)	1737.27	(75)	618	26.2	10.7	1.73
22. Metal Stampings	14155.8	(73)	12625.2	(75)	1530	10.8	156.2	10.21
23. Engines & Turbines	13026.0	(73)	11150.7	(75)	1876	14.4	22.3	1.19
24. Const, Mine, Mater Hndlg Eq.	6760.37	(74)	6332.43	(75)	428	6.3	4.8	1.12
25. Misc. Non-elec Mach	12430.2	(74)	11994.3	(75)	436	3.5	22.0	5.04
26. Serv. Indust. Mach.	49814.6	(74)	44761.1	(75)	5053	10.1	26.1	.52
27. Trans & Switch	8783.63	(73)	7945.64	(75)	838	9.5	18.5	.06
28. Appliances	5766.54	(74)	5082.77	(75)	684	11.9	12.8	1.87
29. Light & Wiring Eq.	7849.14	(73)	6815.57	(75)	1034	13.2	3.2	.31
30. Communication Equipment	6012.55	(73)	5052.59	(75)	969	16.1	21.7	2.24
31. Elec Mach, NEC	14443.8	(73)	13837.9	(75)	606	4.2	2.5	.41
32. Transp. Services	26676.0	(74)	26522.2	(75)	154	0.6	15.1	9.80
33. Instruments	111944.0	(73)	86104.1	(75)	25840	23.1	6.2	.02
34. Misc. Manufacturing	16499.7	(73)	15383.8	(75)	1116	6.8	11.5	1.03
35. Wholesale & Retail Trade	19818.1	(73)	18997.1	(74)	921	4.6	31.8	3.45
36. Business & Legal Services	85990.7	(73)	82387.5	(75)	3603	4.2	123.7	3.43
37. Other Services, NEC	261717.0	(73)	257308.0	(75)	4092	1.6	201.4	4.92
38. Industry shipments rose throughout the NBER reference cycle.	a	a	a	a	a	a	158.6	a
39. Other Services, NEC	a	a	a	a	a	a	316.8	a

TABLE 5-12
STIMULUS NEEDED TO PRODUCE MEASURABLE CHANGE
(Millions of 1972 Dollars)

	Industry Distress	Total LPW Stimulus	% of Distress	20% of Distress
1. Agriculture	2672	36.0	1.3	534.4
2. Mining	3993	135.9	3.4	798.6
3. Food Products	a	10.9	a	a
4. Floor Coverings	711	1.0	.1	142.2
5. Textiles & Apparel	5956	22.9	.4	1191.2
6. Lumber	1312	44.5	3.4	262.4
7. Wood Products	1609	60.4	3.7	321.8
8. Furniture	2098	9.0	2.4	419.6
9. Paper Products	1854	45.4	2.4	370.8
10. Paints	435	18.9	4.3	87.0
11. Chemical Products	4719	67.8	1.4	943.8
12. Petroleum Products	3065	76.8	2.5	613.0
13. Rubber Products	1248	14.4	1.2	249.6
14. Plastic Products	293	35.0	11.9	58.6
15. Leather Products	389	1.0	.2	77.8
16. Glass	325	15.3	4.7	65.0
17. Cement & Clay Products	2781	306.0	11.0	556.2
18. Iron and Steel	4314	223.6	5.2	862.8
19. Non-Ferrous Metals	3638	145.4	4.0	727.6
20. Fabricated Metal	1568	90.5	5.8	313.6
21. Plumbing & Heating Eq.	618	19.1	3.1	123.6
22. Structural Metal Products	1530	256.3	16.7	306.0
23. Metal Stampings	1876	38.2	2.0	375.2
24. Engines and Turbines	428	7.7	1.8	85.6
25. Const. Mine, Mater Handlg Eq	436	37.9	8.7	87.2
26. Misc. Non-elec Mach	5053	44.5	.9	1010.6
27. Serv. Indust. Mach.	838	32.1	3.8	167.6
28. Transf & Switch	684	22.1	3.2	136.9
29. Appliances	1034	5.5	.5	206.8
30. Light & Wiring Eq.	969	37.9	3.9	193.8
31. Communication Eq.	606	4.5	.7	121.2
32. Elec Mach, NEC	154	26.0	16.9	30.8
33. Transp. Commodities	25840	10.5	--	5168.0
34. Instruments	1116	20.3	1.8	223.2
35. Misc. Manufacturing	921	54.5	5.9	184.2
36. Transp. Servs.	3603	209.2	5.8	720.6
37. Wholesale & Retail Trade	4092	345.9	6.7	818.4
38. Business & Legal Services	a	273.1	a	a
39. Other Services, NEC	a	542.3	a	a
TOTAL	92,778	3078.8		18,555.7

a) Industry shipment rose throughout the NBER reference cycle

In terms of total expenditures, the manufacturing industry most heavily affected was Metals, an industry group which experienced considerable cyclical distress; however, construction expenditures provide only a small portion of the final demand for the metals industry. The Lumber & Wood Products and Stone, Clay & Glass industries suffered considerable cyclical distress and are strongly influenced by construction; but except for Cement & Clay products these industries received little stimulus from LPW expenditures in terms of absolute magnitude. All other manufacturing industry groups also received only a relatively small share of LPW expenditures. It should also be noted that the peak year impact of the LPW program occurred three year or more after the trough (when distress was greatest) in all but two cases. In these exceptions the impact was 2 percent of distress or less.¹⁶

In Table 5-12, the impact of the active LPW program relative to the distress of each industry is shown. If 20 percent of distress is taken as the minimum amount of relief of distress which could be called significant, it is clear that the LPW program was not a significant factor in relieving distress for any manufacturing industry. Indeed, only four industries¹⁷ receive a total impact of over 10 percent of industry distress.

The average industry impact for the entire LPW program is only 3.3 percent of industry distress,¹⁸ which is only one-sixth of the rule of thumb for a perceptible industry effect. In current dollars, therefore, the LPW program would have to be \$36 billion in order to have an impact that average 20 percent of industry distress, assuming a similar mix of project types. If one's objective was to relieve 20 percent of industry distress in a single year, the entire sum would have to spent in that year.¹⁹

¹⁶ Mining experienced a trough in 1977, the first year of the LPW program. Leather Products, which received an impact of 0.15 percent of distress, is predicted to recover beginning in 1978.

¹⁷ Electrical Machinery, NEC (16.9%) Structural Metal Products (16.7%); Plastic Products (11.9%) and Cement & Clay Products (11.0%).

¹⁸ This is calculated as total LPW stimulus divided by total industry distress. Twenty-six percent of LPW stimulus occurred in industries with no measured distress.

¹⁹ Virtually all of the impact of the LPW program occurred well after the period of greatest distress. An analysis of the timing of the LPW program is included in Chapter 8.

The small size of the impact of the LPW program on materials industries is primarily due to: (a) the small (in macroeconomic terms) size of the program; (b) the lack of any materials industry targeting criterion in project selection²⁰; (c) the heavy dependence of construction materials suppliers on the other non-construction types of final demand. In view of these factors, it is perhaps unreasonable to expect a program, whose size and composition is designed for the needs of the construction industry, also to be an adequate and effective counter-cyclical program for the range of industries that happen to supply construction materials. In a broader policy context, in fact, the LPW program was not required to have major impacts on these industries, since it was only one of several policy tools used to stimulate economic activity and employment. As such, its impacts beyond the construction industry must be considered in the context of the package of policy tools used. It is only as a contributor to this package -- not as an individual policy -- that the LPW program can be said to have had any significant effect on industries other than construction.

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Over 25 percent of the impact of the LPW program occurred in industries with no distress. Only Structural Metals, Cement & Clay Products, Plastics, and some Machinery received a stimulus that was even remotely significant. The "relief" afforded to Cement and Clay Products is now (1978) exacerbate regional shortage in that industry. The relief afforded standard Metals, Plastics and Machinery was too late in the recovery of these industries to be considered timely.

CHAPTER 6 IMPACTS UPON LOCAL GOVERNMENT

The relationship of the LPW program to local governments is important for two reasons. First, local government actions affected the nature of the program, the projects chosen, and the amount of substitution which resulted. Second, local governments were major intended beneficiaries of the program. Where local governments built useful projects which would not otherwise have been built, the citizens of the locality were directly aided. The local government was also aided where LPW projects resulted in municipal facilities which improved the operation, increased the efficiency, or reduced the maintenance costs of local government activities. Finally, to the extent that local governments built projects which would have otherwise been built with local funds, the locality benefited by having their funds available for other purposes.¹

The Fiscal Situation of Local Governments

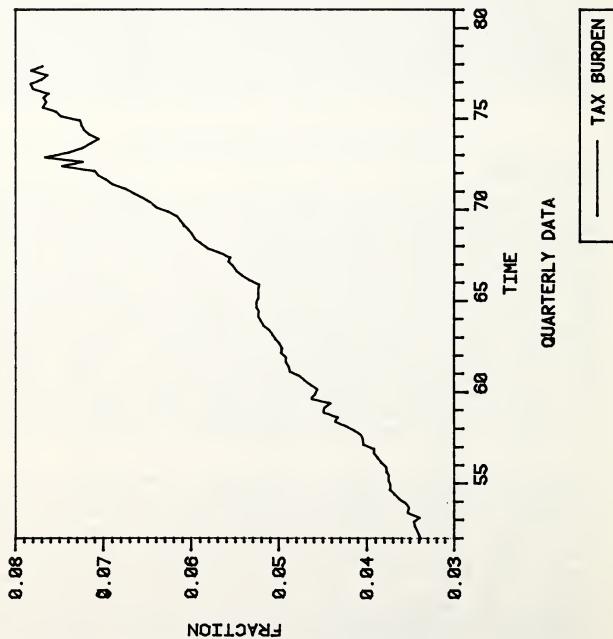
Secular Trends

At the inception of the LPW program, the fiscal situation of many localities was extremely unfavorable by post-war United States standards, due to a combination of the severe 1973-1975 recession and an apparent change in the feelings of Americans toward locality-provided public goods. Prior to the decade of the 1970's there appears to have been a popular consensus that local governments should have the option of raising tax rates to provide additional public services which were deemed necessary. During the post-war period the state and local tax burden,² rose steadily as shown in Figure 6-1, doubling between 1954 and 1970. Only in the early 1970's did public opposition become sufficiently strong to stem increases in the tax burden. At first, when it appeared that local government activities would have to be curtailed due to a lack of local taxing ability, the Federal government used its powers to aid local governments. During the period 1970 through 1973, federal grants-in-aid to state and local governments rose by 66 percent. While there have been previous periods in which grants-in-aid grew dramatically, the growth during the

¹ Substitution is often considered an unmitigated problem with government grant programs, while improved locality fiscal position is considered an unmitigated advantage. Actually the problem and the advantage are the two sides of the same coin and a partial conflict exist between the "jobs creation" and "locality aid" goals of the LPW program. To the extent that substitution is minimized and the jobs creation impact is maximized, localities will have fewer "freed" funds available for adding to their operating expenses and improving their financial positions. To the extent that localities use LPW funds for projects which have been undertaken anyway, their financial position is improved but the job creation impacts, and particularly the "targeting" elements of the job creation impacts are minimized.

²
$$\frac{(\text{State and Local Tax})}{(\text{Personal income} - \text{transfer payments} - \text{Federal Income Taxes})}$$

FIGURE 6-1
STATE AND LOCAL GOVERNMENT TAX BURDEN



1970-1973 period was from a high base and, when combined with data on the locality tax burden, provides an unambiguous indication that Americans believed that localities were in dire need of outside aid. However, the strength of the popular antagonism to increased state and local government expenditures which emerged in the early 1970's appears to be growing continually. The success of Proposition 13 in California and the widespread support of similar measures in other states indicates the magnitude of the shifts in perception of need for local governments to increase their revenues.

Many reasons for the "taxpayer revolt" have been suggested, including the sharp increase in the burden felt by taxpayers during the post-war period, the slowdown in growth of real income during the 1970's, a growing disenchantment with many of the activities regularly undertaken by local government, and a feeling that the need for some local government services has lessened due to demographic and other changes. Yet whatever the causes, the result is clear -- a change in taxpayers' preferences away from increased local government activity. This change in the secular trend has made it far more difficult for localities to manage their fiscal affairs in the 1970's than the 1960's since the option of increasing tax rates to finance desired expenditures is far more circumscribed.

Locality construction expenditures have been particularly affected by the reduced preference for state and local services. As shown in Figure 6-2, construction expenditures are the only major component of state and local expenditures to have declined in relative importance. Interestingly, wage and salary disbursement which are often singled out as both a major part of the increased state and local burden and a major area in which cutbacks can occur have been a remarkably steady percentage of state and local expenditures throughout the post-war period. Part of this decline in construction can be traced to a dramatic reduction in expenditures for construction of new educational facilities. However, as shown in Figure 6-3, many other types of state and local construction expenditures, including that for highways, housing, and miscellaneous buildings, have also been reduced dramatically. The extent to which these reductions in construction expenditures are due to reductions in the perceived need for (and/or increases in the perceived disadvantage of) these types of facilities and the extent to which these reductions were due to state and local budgetary restrictions is, of course, unknown. In view of the large backlog of unfunded projects found by CEAI surveyors in virtually all localities, both factors are certain to be at least partially responsible.

Cyclic Position

In addition to the secular problem faced by local governments, these governments faced substantial additional hardship as a result of the recession of 1973-1975. The impact of recessions upon state and local expenditures is generally quite modest.³ Until the 1973-1975 recession there had been considerable discussion in economic writings as to whether local governments were procyclical (i.e.

3

Prior to 1970, the trend toward increased state and local government activity was so great that some commentators (e.g. Rafuse, Robert W., "Cyclical Behavior of State and Local Finances" in *Essays in Fiscal Federalism* ed. Robert Musgrave, The Brookings Institution, Washington, D.C., 1965) concluded that the trend has, and would continue to, overwhelm any cyclical impacts.

FIGURE 6-2

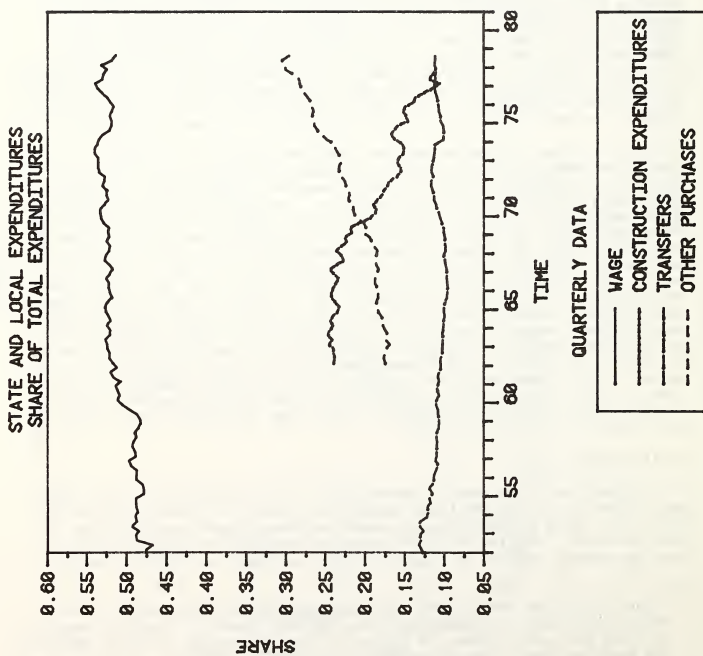
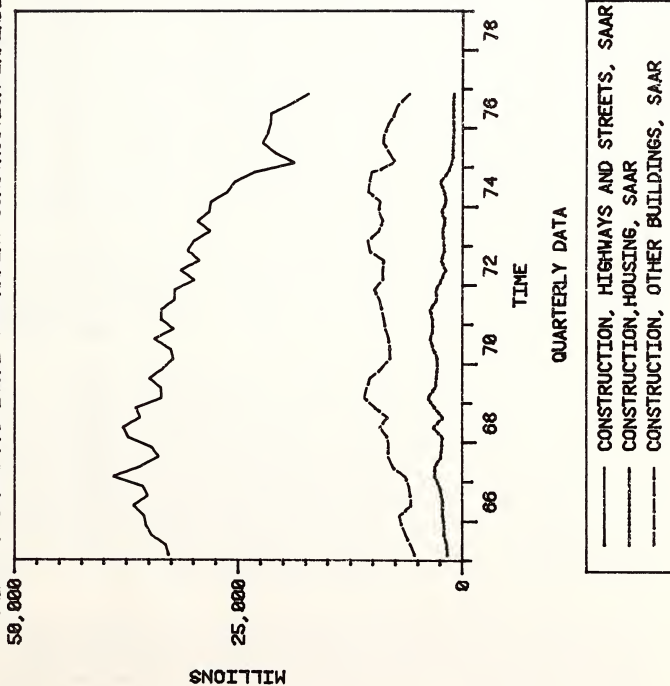


FIGURE 6-3

SELECTED STATE AND LOCAL GOVERNMENT CONSTRUCTION EXPENDITURES



local governments, given a modest reduction in revenues and perhaps even an increased ability to float bonds, managed to maintain and/or increase expenditures -- thus acting to aid the economy).⁴

In view of the lack of consistency in conclusions on this issue, and the lack of clear procedure for dating state and local government cycles, CEAI has conducted an additional assessment of the cyclical response of local governments. In the process it was found that the nature of the response of state and local government to the economic cycle is far more complex and difficult to determine than has been suggested by most commentators. For example a simple examination of state and local expenditures is not sufficient to examine the cyclicity of local government expenditures. The trend in expenditures for the last few decades has been rising so steadily that prior to 1970, cycles as such were virtually nonexistent. Also, state and local expenditures and taxes are not independent; even in constant dollars the two variables have a correlation coefficient of almost 0.99. The obvious solution to this problem, combining the two concepts and examining surpluses or deficits, produces the following difficulty of interpretation: surpluses may respond either to the general economy or to local government policy, and the two responses will have the opposite significance. For example, if surpluses begin to fall, it could signify expansionary spending from a comfortably sated treasury, or revenue losses resulting from the onset of a recession. Similarly an upturn in surpluses could reflect a recovering economy or a local belt-tightening campaign -- perhaps required by increasing financial pressures. In both examples the first response reflects expansionary conditions, while the second reflects contradictory conditions.

Several other potential measures of fiscal tightness exist. One of these is the interest rate at which local governments borrow. Sharp rises in the interest rates paid by local governments relative to other interest rates can indicate an increase in the perceived degree of "risk" in lending to local governments. Construction expenditures form final type of evidence on cyclic positions of local governments. They are durable and constitute an interruptable expenditure that is especially susceptible to fiscal distress.

A representative locality fiscal cycle can be characterized as follows. The onset of fiscal distress (downturn from peak) is marked by rising locality interest rates and falling revenues and surpluses (although surpluses may already be falling). During the period of distress, interest rates will be high, and localities will reduce expenditures -- particularly construction. As budgets are tightened surpluses will rise again. This will occur during the distress if it is prolonged, but will coincide with the recovery if the distress period is brief. The beginning of the locality recovery (trough and upturn) is marked by declining locality interest rates, recovery revenues, and rising surpluses. Once the recovery is firmly established, expenditure (including construction) will rise again, and surpluses will be adjusted downwards. This cyclic pattern of movement for these variables is not always consistent. This pattern is useful, however, for identifying and interpreting cycles in state and local government fiscal conditions.

4

Virtually all of the literature deals with the issue of (and uses the terms "procyclical" and "counter-cyclical" from the perspective of) the effect of state and local expenditures on the economy, rather than their response to the economy. Thus there has been very little analysis of the actual cyclic position of state and local governments.

Figure 6-4 and Table 6-1 show revenues for state and local governments in current dollars (REVCR) and in constant dollars (REV72). Expenditures are also shown in current dollars (XPENDCR) and in constant dollars (XPEND72). These variables all have a strong upward trend, and -- as noted earlier -- expenditures and revenues move closely together. Two measures of state and local government surpluses are shown in Figure 6-5 and Table 6-2. One (SURPLUS) includes state and local contributions for social insurance, while the other (NTSURPLUS) is net of these contributions. Several ratios measuring relative state and local interest rates are shown in Figure 6-6 and Table 6-3 including: state and local interest rates relative to the rates on U.S. bond issues (SLUS); state and local interest rates relative to a composite corporate bond rate (SLCORP); municipal bond interest rates relative to Moody's AAA corporate bond rates (MUNC3A); and state and local government BAA bond rates relative to state and local AAA bond rates (SLBAA3A).

After comparing the path of these variables to the path of the economy and the timing of the national business cycle, as estimated by the National Bureau of Economic Research (NBER), CEAI found that locality fiscal cycles lag the NBER cycles. A comparison of CEAI's estimates of local government cycles to the NBER reference cycles is shown on Table 6-4. Prior to the most recent cycle, the locality cycle lags appear surprisingly short, relative to the lag that might be suggested by identification and budgetary response lags. In these earlier cycles the locality cycle peak does not consistently lag the national peak, and the locality trough appears to occur approximately one quarter after the trough in the general economy. This result, however, may be an artifact of a strong upward trend, which results in a shorter recession with later peaks and earlier troughs than would occur if the trend were either non-existent or downward. As shown in Table 6-4, the 1973-1975 recession (after the trend in local government activity was reversed) produced a far lengthier period of locality distress. While the locality peak did occur three quarters after the NBER reference cycle peak in this case, the final trough of the cycle for local governments did not occur until the fourth quarter of 1976 -- almost two years after the trough in the cycle for the general economy.

The reason for the extreme severity of the 1973-1975 cycle on local government are not hard to discern. As noted above, the trend of increasing local revenues, tax burden, grants-in-aid, and expenditures had been dampened and in some cases even reversed. Also the 1973-1975 recession was substantially more severe than previous recessions. Finally, the well publicized financial difficulties of some of the nation's largest cities undoubtedly contributed to a growing feeling on the part of both local government officials and citizens that fiscal restraints on the part of local governments were more necessary than before. The LPW program can be seen as a partial response to the unusual distress faced by state and local governments and the relatively large reductions in construction that appeared to be resulting from this distress.

FIGURE 6-4

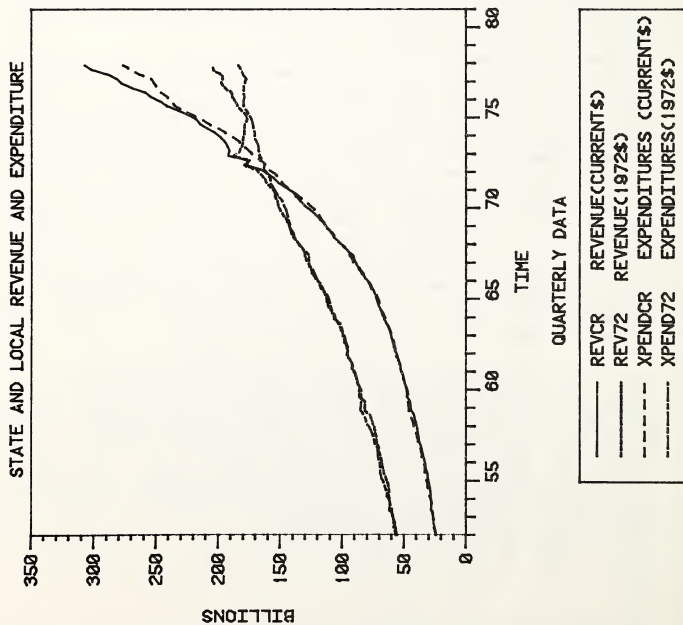
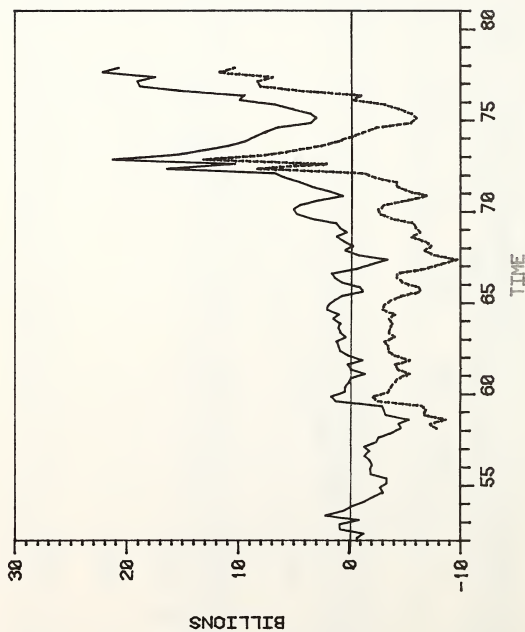


TABLE 6-1

STATE AND LOCAL REVENUE AND EXPENDITURE, BY QUARTER, (BILLIONS OF DOLLARS)

YEAR	REVENUE, CURRENT \$ (REVCR)	REVENUE, 1972 \$ (REV72)	EXPENDITURES, CURRENT \$ (XPENDCR)	EXPEND, 1972 \$ (XPEND 72)
1965.1	76.6	112.7	71.7	111.3
1965.2	74.2	114.5	73.8	113.9
1965.3	75.9	115.9	76.7	117.1
1965.4	77.7	117.9	78.3	118.8
1966.1	81.0	121.3	80.5	120.5
1966.2	83.8	123.4	82.9	122.1
1966.3	86.3	125.1	85.2	123.5
1966.4	88.2	126.2	88.7	126.9
1967.1	90.1	126.7	91.5	128.7
1967.2	91.0	126.4	93.5	129.9
1967.3	94.7	129.7	95.3	130.5
1967.4	98.6	133.2	98.3	132.8
1968.1	102.4	136.0	102.6	136.3
1968.2	106.1	138.9	105.8	138.5
1968.3	108.8	140.8	107.9	139.6
1968.4	111.6	142.0	111.4	141.7
1969.1	114.3	142.9	113.6	142.0
1969.2	117.6	144.6	116.6	143.4
1969.3	121.4	147.3	118.6	143.9
1969.4	125.4	149.6	121.4	144.9
1970.1	129.9	151.6	125.6	146.6
1970.2	133.4	152.1	129.5	147.7
1970.3	137.0	153.8	134.6	151.1
1970.4	139.5	153.8	139.0	153.3
1971.1	145.5	157.1	143.9	155.4
1971.2	151.1	160.6	147.9	157.2
1971.3	154.4	162.0	150.1	157.5
1971.4	159.4	165.9	153.8	160.0
1972.1	165.5	169.2	158.9	162.5
1972.2	177.2	178.8	160.8	162.3
1972.3	175.5	173.9	165.3	163.8
1972.4	191.5	187.4	169.7	166.0
1973.1	190.7	182.3	174.6	166.9
1973.2	192.0	180.3	178.2	167.3
1973.3	194.0	179.5	182.3	168.6
1973.4	197.2	179.3	186.9	169.9
1974.1	201.8	178.3	192.3	169.9
1974.2	208.1	178.6	199.3	171.1
1974.3	214.2	178.1	206.5	171.7
1974.4	217.3	176.1	213.1	172.7
1975.1	223.7	177.1	220.0	174.2
1975.2	231.8	180.2	227.3	176.8
1975.3	240.8	184.0	234.2	178.9
1975.4	246.4	185.7	237.5	179.0
1976.1	246.4	185.7	237.5	179.0
1976.2	253.8	188.1	240.5	178.3
1976.3	258.4	188.9	245.5	179.5
1976.4	269.0	194.1	247.9	178.9
1977.1	277.5	197.2	251.1	178.5
1977.2	281.0	196.0	253.7	176.9
1977.3	288.1	197.1	262.6	179.6
1977.4	301.6	203.6	268.7	181.4

FIGURE 6-5
STATE AND LOCAL GOVERNMENT SURPLUS
(1972\$)



QUARTERLY DATA

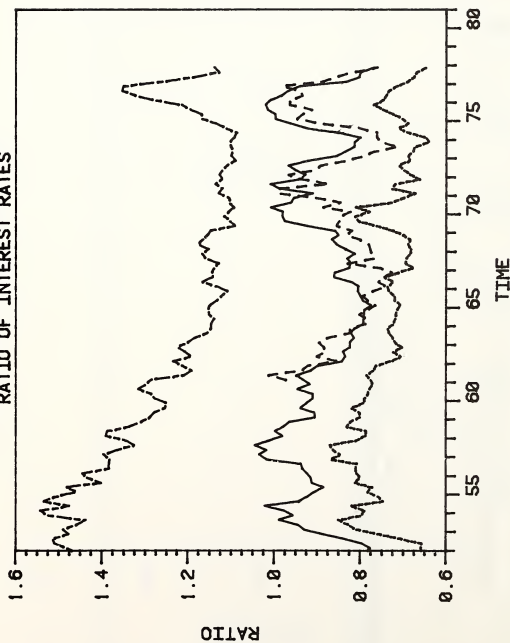
— SURPLUS<INC. SOCIAL INSURANCE CONTRIBUTIONS>
- - - SURPLUS<NET OF SOCIAL INSURANCE CONTRIBUTIONS>

TABLE 6-2
STATE AND LOCAL GOVERNMENT SURPLUS (1972 DOLLARS)
(BILLIONS OF DOLLARS)

<u>Year</u>	<u>Surplus Including Social Insurance Contributions</u>	<u>Surplus Net of Social Insurance Contributions</u>
1965.1	1.4	-3.7
1965.2	0.6	-4.6
1965.3	-1.2	-6.4
1965.4	-0.9	-6.2
1966.1	0.7	-4.8
1966.2	1.3	-4.3
1966.3	1.6	-4.3
1966.4	-0.7	-6.9
1967.1	-2.0	-8.2
1967.2	-3.5	-9.7
1967.3	-0.8	-7.7
1967.4	0.4	-6.8
1968.1	-0.3	-7.4
1968.2	0.5	-6.8
1968.3	1.2	-5.6
1968.4	0.3	-6.4
1969.1	0.9	-6.0
1969.2	1.2	-5.8
1969.3	3.4	-3.9
1969.4	4.8	-2.7
1970.1	5.0	-2.6
1970.2	4.4	-3.2
1970.3	2.7	-5.1
1970.4	0.6	-7.1
1971.1	1.7	-5.4
1971.2	3.4	-4.3
1971.3	4.4	-4.2
1971.4	5.8	-2.3
1972.1	6.7	-1.3
1972.2	16.4	8.4
1972.3	10.2	2.1
1972.4	21.3	13.1
1973.1	15.4	7.3
1973.2	13.1	4.8
1973.3	10.8	2.5
1973.4	9.4	1.0
1974.1	8.4	-0.3
1974.2	7.6	-1.3
1974.3	6.4	-2.4
1974.4	3.4	-5.5
1975.1	2.9	-6.0
1975.2	3.5	-5.6
1975.3	5.0	-4.4
1975.4	6.7	-3.2
1976.1	9.9	-0.3
1976.2	9.4	-1.1
1976.3	15.2	4.5
1976.4	18.8	8.0
1977.1	19.0	8.3
1977.2	17.4	6.8
1977.3	22.2	11.7
1977.4	20.7	10.2

FIGURE 6-6

INTEREST RATE COMPARISONS
RATIO OF INTEREST RATES



QUARTERLY DATA

- SLUS STATE - LOCAL TO U.S. BONDS
- SLCORP STATE - LOCAL TO CORPORATE BONDS
- MUNC3A MUNICIPAL TO CORPORATE AAA
- SLBAA3A STATE - LOCAL BAA TO AAA

TABLE 6-3

INTEREST RATE COMPARISONS RATIO OF INTEREST RATES

Year	<u>State and Local</u> U.S. Bonds (SLUS)	<u>State and Local</u> Corporate Bonds (SLCORP)	<u>Municipal</u> Corporate AAA (MUNC3A)	<u>State and Local BAA</u> Corporate AAA (SLBAA3A)
1965.1	0.88	0.71	0.76	1.15
1965.2	0.90	0.72	0.78	1.13
1965.3	0.80	0.72	0.79	1.12
1965.4	0.81	0.74	0.77	1.11
1966.1	0.81	0.74	0.74	1.13
1966.2	0.82	0.72	0.76	1.11
1966.3	0.86	0.75	0.75	1.14
1966.4	0.86	0.71	0.73	1.15
1967.1	0.83	0.68	0.76	1.14
1967.2	0.82	0.70	0.83	1.13
1967.3	0.83	0.69	0.77	1.16
1967.4	0.81	0.68	0.77	1.17
1968.1	0.84	0.68	0.78	1.15
1968.2	0.86	0.69	0.78	1.14
1968.3	0.87	0.68	0.80	1.17
1968.4	0.85	0.70	0.83	1.15
1969.1	0.86	0.72	0.82	1.15
1969.2	0.93	0.76	0.86	1.09
1969.3	0.98	0.81	0.85	1.10
1969.4	0.98	0.81	0.85	1.12
1970.1	0.98	0.78	0.82	1.11
1970.2	1.01	0.81	0.89	1.09
1970.3	0.96	0.73	0.85	1.10
1970.4	0.95	0.70	0.90	1.10
1971.1	0.91	0.67	0.99	1.13
1971.2	0.99	0.73	0.99	1.12
1971.3	1.01	0.72	0.87	1.14
1971.4	0.94	0.66	0.94	1.12
1972.1	0.93	0.68	0.97	1.13
1972.2	0.95	0.70	0.90	1.12
1972.3	0.97	0.71	0.89	1.11
1972.4	0.92	0.69	0.83	1.09
1973.1	0.85	0.69	0.79	1.10
1973.2	0.83	0.68	0.77	1.10
1973.3	0.81	0.67	0.71	1.10
1973.4	0.81	0.64	0.75	1.10
1974.1	0.80	0.65	0.76	1.09
1974.2	0.85	0.69	0.76	1.09
1974.3	0.93	0.71	0.80	1.11
1974.4	0.96	0.69	0.90	1.14
1975.1	0.10	0.70	0.95	1.17
1975.2	0.10	0.72	0.93	1.17
1975.3	1.02	0.75	0.91	1.19
1975.4	1.02	0.77	0.96	1.21
1976.1	1.01	0.75	0.96	1.28
1976.2	0.98	0.74	0.94	1.32
1976.3	0.97	0.73	0.94	1.35
1976.4	0.94	0.72	0.98	1.35
1977.1	0.83	0.69	0.89	1.26
1977.2	0.80	0.67	0.86	1.19
1977.3	0.80	0.67	0.82	1.13
1977.4	0.77	0.65	0.76	1.14

TABLE 6-4

COMPARISON OF CYCLES

NBER Reference Cycle		Estimated Local Government Cycle	
<u>Peak</u>	<u>Trough</u>	<u>Peak</u>	<u>Trough</u>
1957.3	1958.2	1957.1	1958.3
1960.2	1961.1	(1960.4	1961.1)
		1966.4	1967.2
1969.4	1970.4	1969.4	1971.1
1973.4	1975.1	1974.2	1976.4

Unfortunately, by the time Round I of the LPW program commenced, local governments were already nearly two quarters into their expansionary phase, despite their slow recovery. Indeed, the period of expenditures (1977 to the present) has many apparent earmarks of an expansionary phase. Both revenues and expenditures advanced, with surpluses reaching an all-time high in 1977.3. In addition, interest rates paid by state and local governments were falling relative to other interest. Despite these consistently expansionary signs, construction -- both in constant dollars and as a share of state and local expenditures -- reached an all-time low for the data in 1977.1, perhaps reflecting some aftereffect of the economic contraction. However, since given by late 1977 construction expenditures had not recovered the ground lost in 1976, it appears that most of the downturn in construction was also a result of factors other than budgetary restraint, including the existence of other federal matching programs which reduced the relative cost of non-construction activities, a possible shift in value preferences, and perhaps some intertemporal substitution in anticipation of increased Federal aid.

In order to determine if the impact of the cycle varied by type and size of local government units, CEAI also studied the cycles of cities by size class. In general the data on municipalities do not suggest any differences in timing of cycles from those of the state and local data. Large cities, however, appear to have been hit relatively hard by the last two contractions, and to have recovered relatively late, although the data may be distorted by New York City. Medium cities -- which are probably the fastest growing of the three classes, show relatively weak cyclic fiscal effects. Also the pattern of surpluses and financial market conditions for large cities tends to confirm the view that recent periods of high and/or rising surpluses were at least initially signs of weakness rather than strength.

The LPW Program and Local Government Budgets

Locality Budgets

Considerable variation exists between localities in the types of budgeting used and the degree of control exercised by various local government officials. For example, the capital budgets of some localities are integrated with the operating budgets; for other localities they are separate. The capital budgets for some localities may include projects financed by state and federal grants; for other localities separate "federal" budgets often exist. In some cases, projects are considered "special" (often because of separate bond funding) and are not integrated into the budgeting process at all. Similarly, the budgets of some localities incorporate projects constructed by special districts; in other localities these special districts are omitted. Most localities include at least some non-construction items in the capital budget, including heavy equipment purchases, property acquisition costs, interest expenses, and in some cases even debt repayment. Also the degree to which the budget anticipates the actual expenditures of the locality varies considerably. In some localities department heads and other persons with similar responsibilities have considerable latitude in switching funds between different categories of expenditures within their area. In other localities the degree of control maintained by the chief executive or the city council is much greater.

Despite this diversity there are some broad conclusions that can be reached concerning the locality budgeting process, particularly with regard to capital expenditures. First, even within the budget year there is a great deal of flexibility in the process of carrying out a budget. While the form of this flexibility often varies -- in larger cities its generally department heads while in smaller cities, problems are often taken directly to the city council -- few if any localities have a budget that is so fixed that an emergency project could not lead to substitution. Second, for most localities there is a long run capital budget. This long run budget is not really a budget but more of a planning "wish list", which specifies a list of the projects which the locality would like to undertake during the coming 5-10 years. Project priorities are usually not specified, and only rarely is thought given to the sources of funding for the projects. Locality officials recognize that many projects on the list will not be built in the immediate future due to a lack of funds, unsolved problems concerning community opposition, or other constraints. Furthermore, the nature of the project itself may change should financial pressures change. For example, if a project to renovate a library is in the capital budget and federal construction funds become available, the renovation may be expanded and modified to include the addition of a wing to the library, or perhaps even a complete replacement of the facility. Since almost all local governments have a large backlog of desired projects on their "wish list", there is rarely a problem in finding a use for unexpected funds should they become available in the form of closed end grants-in-aid.

Just as the presence of an item in a locality's capital budget does not mean that that project will be built, the absence of a project from the capital budget does not mean that a project will not be undertaken. If, for example, a storm were to destroy a needed locality facility, most localities would have the flexibility to shift funds within the present year and virtually all would have the flexibility to change the coming year's budget.

This finding of flexibility should not be taken to imply that local operating budgets and capital budgets are not important. Different types of locality expenditures do have constituencies both within the outside the local government. In most cases, locality officials would prefer not to disrupt the pattern of expenditures which have been budgeted. Indeed, some of the clearest and largest instances of substitution found by CEAI involved the use of LPW funds for a project which had not been budgeted but for which an emergency need arose. If the need for an additional facility became evident in the middle of a planning year as a result of a court order, natural forces, or the discovery of some previously unrecognized need, and LPW funds fortuitously became available at approximately the same time, locality officials often simply used the LPW funds to meet this previously unrecognized need. In the cases where a previously unrecognized need arose suddenly, the existence of budgets seems to have acted to increase rather than decrease the amount of substitution which occurred as a result of the LPW program.

The Impact of LPW Funding

In order to gain a clearer understanding of the impact of the LPW program upon localities, CEAI compared the level of LPW grants to localities' capital budgets and discretionary portion of the capital budgets for each class of locality. CEAI's prime approach to this task used as a definition of capital budgets "construction expenditures as defined by the Bureau of the Census." This definition has several advantages. The Census Bureau attempts to incorporate all of the capital expenditures from all of the budgets in a locality. The data on capital outlays are adjusted to a National Income and Product Account (NIPA) basis and are as nearly analogous to construction in both timing and type of outlays as possible. However for most localities, the data are either not collected or are based upon unchecked survey responses. Also the Census data do not include one major item of information, the source of the financing of the expenditures. Finally, the data are designed to reflect the result of a fairly detailed set of calculations rather than the localities' perceptions of their budgets.

Similar analysis was undertaken using data on capital budgets "as defined by the locality" obtained from CEAI's survey. This definition measures local perception and is consistent with the answers to related questions on the CEAI survey, such as the source of the funding of the capital budget. Local perceptions of capital budgets vary greatly from locality to locality in terms of the types of revenue and expenditures included and the data are available only for the cities surveyed by CEAI.

In 1976, the last year before the start of the LPW program, total capital expenditures of state and local governments on an NIPA basis were \$31.7 billion. LPW funding of \$6 billion was therefore equal to approximately 19 percent of total state and local capital budgets for a single year.⁵ State capital expenditures for 1976 are estimated to be \$12.5 billion.⁶ Since only \$0.4 billion of LPW funds were distributed to the states, LPW funding was equal to approximately 3 percent of one year's total state capital expenditures.⁷ LPW funding equaled approximately 29 percent of one year's total local capital expenditures.

⁵ These figures are not adjusted for inflation. In 1977, despite the LPW program, aggregate state and local construction expenditures, measured in current dollars, actually fell.

⁶ David J. Levin, Receipts and Expenditures of State Government and Local Governments, 1959-76, Survey of Current Business, May, 1978.

⁷ This calculation assumes that the LPW program can be compared to a single year's expenditures. This is correct if localities treated the funds as a single point windfall and perceived the fiscal benefit in terms of occurring at the time the grant was awarded. For most localities, the funds will be used during two fiscal years. For recipients of both Round I and Round II funds, the LPW period will encompass 3 years. Thus some might argue that the LPW expenditures should be compared to several years of capital budgets and that the percentages shown above overstate the importance of LPW by a factor of 2 in most cases and 3 for the localities which received both Round I and Round II funds.

TABLE 6-5

COMPARISON OF LPW FUNDING AND TOTAL CONSTRUCTION EXPENDITURES

Locality Class	LPW Funding \$billion	Construction Expenditures \$billion		LPW Funding as a Percent of Estimated 1976 Construction Expenditures
		FY 1972	Estimated 1976	
City ^a	3.5	7.2	8.6	40
County	1.0	2.6	3.1	32
School District	.8	2.6	3.1	25

^a Municipal plus township

TABLE 6-6

COMPARISON OF LPW EXPENDITURES TO CONSTRUCTION SPENDING
(NIPA BASIS)
36 SAMPLED LOCALITIES

Locality Class	Number of sampled localities	LPW Expenditures (\$ Million)	Construction Expenditures (\$ Million)	LPW Percentage
City	25	181.4	558.8	32
County	3	2.9	7.6	38
School District	8	6.0	101	6 ^a

a) 60% without Chicago

To examine LPW funding by class of government, CEAI updated the 1972 Census of governments data to a 1976 equivalent.⁸ LPW funding by class of locality relative to 1976 construction expenditures are shown in Table 6.5.⁹ LPW funding was equal to approximately 40 percent of total city construction spending, 32 percent of total county construction spending, and 25 percent of total school district construction spending.

Unpublished Census Department construction data for 1976 were found to exist for 36 of the 50 localities surveyed, of which 25 were cities, 3 were counties and 8 were school districts. By dividing the LPW grants received by these localities by the capital expenditures of these localities one can obtain funding estimates similar to those in the last column of Table 6-5. These results are reported in Table 6-6. The data suggest that this subsample, although not an exact representation of the population data, is at least representative for cities. The limited number of observations suggests that the data for counties should be treated as indicative only. The school district data were skewed by huge non-LPW expenditures in Chicago. Without Chicago the LPW funding for school districts would have been 60 percent of construction spending.

The survey data collected by CEAI indicate that localities and particularly cities often base their planning on "capital budgets" which are smaller than one would expect based upon the NIPA data. In fact, 10 percent of the localities surveyed reported that, as a general rule, they undertake no locally financed capital projects at all! The main explanation appears to be that localities often exclude "special" and federally funded projects from their anticipated capital budget. Since projects built with federal or state categorical grant funds are uncertain as to timing, and are, in any case, outside the usual priorities-setting procedure, most localities view grant funds differently from locally raised funds. In the largest jurisdictions, the receipt of federal and state funds is presumed and incorporated into the budget. However, even in these cases the "loss" of the funds is more likely to result in project delay than the transfer of funds from other areas. In the medium-sized and small localities, grants-in-aid for construction often are either in a separate budget or are not in the budget documents at all.

LPW Expenditures and Discretionary Capital Expenditures

Defining the "discretionary" portion of a capital budget is almost impossible. While in most localities, 100 percent of all capital budget funds were reported to be "earmarked", top local officials almost always retain sufficient authority to shift funds and to delay or speed up capital projects as necessary. "Need" cannot be used to distinguish between discretionary and non-discretionary projects, since in many cases, CEAI surveyors found many "critical necessary" bridges, sewage treatment plants, and other facilities which -- due to contractor difficulties, environmental restrictions, a lack of funds, or other causes -- were delayed for many years and in some cases indefinitely.

⁸ 1972 expenditures were multiplied by the ratio of total local capital spending in 1976 to total local capital spending in 1972. This process adjusts for both inflation and real growth (decline) but assumes that the relative importance of construction for the alternative classes of local governments did not change.

⁹ LPW funding as a percent of capital outlays (which include non-construction expenditures) was 5-8 percentage points lower for each class.

In an attempt to sort out these issues, it was assumed that as a first approximation that expenditures not financed from local funds were not "discretionary". Although localities do have the option of rejecting federal or state construction funds, it was assumed that, except in special circumstances, most local officials would not refuse outside funding. The most recent data available from federal sources describing the percentage of locally financed capital expenditures is for 1973.¹⁰ At that time, federal aid comprised 25 percent of total state and local gross fixed capital formation. Gramlich¹¹ has estimated that this percentage had risen to 29 percent by 1976. No further breakdown by locality class from either source is available. In 1976, however, local receipts of grants-in-aid (including state grants) were 48 percent of total expenditures, while state receipts were only 29 percent of expenditures. Thus locality reliance upon grants-in-aid for construction is likely to be significantly higher than state reliance.

As part of our survey effort, CEAI gathered data on the financing of capital expenditures. Data are available for 22 cities, 4 counties and 8 school districts. Based upon these data, Table 6-7 shows a comparison of LPW expenditures to locally financed¹² capital expenditures. The major difference between LPW expenditures as a percentage of total construction expenditure (Table 6-6) and LPW expenditures as a percentage of locally financed capital budgets occurs for cities, which rely relatively upon grants-in-aid. For the 22 sampled cities for which data are available, LPW expenditure equaled almost 60 percent of the locally financed capital budget. This suggests that the LPW program provides very important aid to the construction budgets of cities.

Based upon the yearly variation in expenditures and the expenditures in localities where few locally financed projects are ever undertaken, CEAI has made a crude, but conservative estimate that 25 percent of all locally financed expenditures are "discretionary". Based upon this estimate, the relation of LPW expenditures to discretionary capital expenditures can be calculated on a locality perception basis and on NIPA basis. These results are shown in Table 6-8 and 6-9, respectively. As is evident from Table 6.8 and 6.9, LPW funding formed quite a large percentage of discretionary construction expenditures for recipient localities. While the limited data available and the difficulty of defining "discretionary" make precise estimates impossible, it does seem that LPW expenditures were equivalent to about three quarters of the 1976 discretionary construction expenditures for recipient cities and approximately two-fifths of the 1976 discretionary construction expenditures for counties and school districts.

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Paul Schneiderman, "State & Local Government Gross Fixed Capital Formation: 1958-73; Survey of Current Business, October 1975.

11

Edward Gramlich, "State and Local Budget The Day After It Rained: Why is the Surplus So High" Brookings Paper on Economic Activity 1978.

12

Debt, local taxes and fees.

TABLE 6-7

COMPARISON OF LPW EXPENDITURES TO LOCALLY FINANCED
PORTIONS OF THEIR CAPITAL BUDGETS
LOCALITY PERCEPTION BASIS
31 SAMPLED LOCALITIES

Locality Class	LPW Expenditures (\$ Million)	Locally Financed Capital Budgets (\$ Million)	LPW Percentage
Cities	95.2	166.1	57
Counties	3.2	11.0	29
School District	6.0	128.0	5a

a) 38% without Chicago

TABLE 6-8

COMPARISON OF LPW EXPENDITURES TO DISCRETIONARY CAPITAL EXPENDITURE
LOCALITY PERCEPTION BASIS
31 LOCALITIES

Locality Class	LPW Expenditures (\$ Million)	Estimated Discretionary Capital Outlays (\$ Million)	LPW Percentage
Cities	95.2	124.6	76
Counties	3.2	8.3	39
School District	6.0	96.0	6 ^a

a) (51% without Chicago)

TABLE 6-9
COMPARISON OF LPW EXPENDITURES TO DISCRETIONARY CONSTRUCTION EXPENDITURES
ALL LOCALITIES
NIPA BASIS

Locality Class	LPW Expenditures (\$ Billion)	Estimated Discretionary Construction Expenditures (\$ Billion)	LPW Percentage
Cities	3.5	4.2	83
Counties	1.0	2.1	48
School District	.8	2.0	38

The proportion of LPW recipients who received LPW awards of more than 100 percent of their discretionary capital budgets are of particular interest. Of the 24 cities for which sufficient data are available to make this determination, 19 -- or 71 percent -- received LPW awards which were greater than 100 percent of a single year's discretionary capital budgets.¹³ Half of the counties and 50 percent of the school districts also received LPW grants which were in excess of 100 percent of their discretionary capital budgets.

Comparison of the Types of LPW Projects to Normal Capital Expenditures

Work type codes supplied by EDA were used to aggregate the LPW projects into budget expenditure categories which are comparable with the Census Bureau's local government construction data. A comparison of the distribution of LPW awards by type of project and the Census data for all localities' expenditures is shown in Table 6-10. Clearly, localities were not awarded, or did not choose, projects representative of their normal capital investment patterns. The largest budget shares normally go to Education, Sewage, Local Utilities, and Highways. Education's share was a third smaller among LPW projects than in the normal capital budget, which represents a sharp acceleration of the prevalent downward trend in these types of expenditures. The share of local Utilities is over 25 percent smaller in LPW awards. Sewage's share of LPW funds is also over a third lower than in the capital budget, despite its large upward trend in locality expenditures. Highways, the only homogeneous major budget category to receive a larger than normal budget share of funds, has a share of LPW funds well over 50 percent higher than normal. The "Other" category, including items such as locality office buildings received a share of LPW funds nearly 2.5 times its normal budget share.

Many of the same relationships are found upon examination of the comparable data for all municipalities, as shown in Table 6-11. Since the historical construction expenditure data are collected on a slightly different basis, it is possible to derive an important inference concerning the large relative expenditure in the "Other" category noted earlier. Data for municipalities, however, have a separate category for "General Public Buildings". For this category, the LPW share of funds is over four times as large as the normal share of the budget. This would suggest that much of the additional "Other" spending for all localities is in the area of general public buildings.

As was the case with all localities, the municipal budget categories that are "low-funded" by LPW (i.e., receive a lower than average share of LPW funds) are basic nuts-and-bolts services and/or categories that have relatively strong sources of finance. All, except Housing & Urban Renewal, have substantial revenues in the form of fees or more-or-less earmarked taxes. Housing & Urban Renewal and Transport & Transit also receive major earmarked Federal funding. In addition, Education, Sewage, and Utilities are all such basic services that they are politically quite visible. It appears, then, that the categories deemphasized in terms of LPW funding are those that either are sufficiently important in their own right to warrant relatively reliable funding from other sources, or have major amounts of other non-local funding.

¹³

See Footnote 7.

TABLE 6-10

COMPARISON OF CENSUS TRENDS AND LPW DISTRIBUTION BY BUDGET SHARE, LOCALITIES

	<u>Three-Year Census Average 1973/74 - 1975/76</u>		
	<u>Budget Share</u>	<u>Average Annual Change</u>	<u>LPW Budget Share</u>
Education	23.60	- .55	15.7
Highways	12.17	- .10	19.1
Health & Hospitals	3.40	.34	3.4
Sewage	15.37	1.15	9.7
Local Parks & Recreation	4.07	-	12.6
Natural Resources	1.33	- .10	0.9
Housing & Urban Renewal	4.73	-1.10	1.0
Transport & Transit	7.43	- .70	1.5
Local Utilities	14.97	.15	11.0
Water Supply	8.63	.10	7.5
Electricity	6.17	.10	0.3
Gas Supply N.E.C.	.20	-	-
All Other	12.83	.85	30.3

TABLE 6-11

COMPARISON OF CENSUS TREND AND LPW
DISTRIBUTION BY BUDGET SHARE MUNICIPALITY

	Three-Year Census Average 1973/74 - 1975/76		
	<u>Budget Share</u>	<u>Average Annual Change</u>	<u>LPW Budget Share</u>
Education	8.63	-1.27	4.18
Highways	18.20	.76	21.36
(Own) Hospitals	1.88	-.06	1.81
Sewerage	22.75	2.31	16.35
Parks & Recreation	8.62	.02	14.62
Housing & Urban Renewal	9.63	-2.91	1.17
General Public Buildings	3.73	.31	15.25
Other	26.58	.86	25.30

Of the categories that are "high-funded" by LPW, two contrast sharply with the "low-funded" categories. Local Parks & Recreation facilities which are becoming increasingly more important as urban areas grow in size but have little or no built-in revenue sources. The high funding in the "Other" category for all localities appears to be in areas such as General Public Buildings which are useful but unable to generate widespread political or financial support.

The category of Highways appears to contradict the pattern that "high-funded" categories tend to be general use categories without major constituencies or sources of funding. However, upon closer inspection it was found that 40 percent of the LPW funds devoted to Highways are to "repair, rehabilitate, renovate, and/or maintain" them. Another 13 percent is for a combination of this work type and a work type called "addition, extension, extend, expand". (For municipalities these percentages are slightly higher.) Thus about half of the LPW funds for Highways, an exceptionally large fraction, are being used for upkeep. This corresponds with recent reports that road maintenance has fallen seriously below normal "wear and tear" and suggests an additional characteristic that would lead to high LPW funding: deferability. Upon inspection, this attribute certainly applies to expenditures for public buildings, and probably to Parks & Recreation facilities as well.

The share of funds for each budget category awarded in Round I are compared to the share awarded in Round II of the LPW program in Table 6.12. This may be interesting since -- although the population of potential projects was determined by the applications -- the selection of Round I projects was made by the Economic Development Administration, while the Round II projects were selected entirely by the local jurisdictions. About half the categories receive similar shares in both Rounds. The shares of Highways and of Parks & Recreation, however, are substantially higher in Round II than in Round I. By contrast, the share of Education is substantially lower, and the shares of Sewage, Utilities, and Other are slightly lower in Round II than in Round I. Except for the small decline in "Other", all the deviations of Round II from Round I are similar in direction to the deviations of total LPW shares from normal budget shares described above. Thus comparisons of LPW expenditures by type to normal expenditures, and the comparison of Round I and Round II expenditures support the hypothesis that LPW funds were used disproportionately for types of projects which were (a) without alternative major earmarked funding; (b) relatively easily deferrable and probably had been deferred on occasion; and (c) not visibly important enough to sustain active political support. This hypothesis, in turn, implies that the LPW projects were useful but not so critical that most of the projects would otherwise have been funded locally. This implication plays an important role in explaining the relatively low level of substitution found by CEAI.¹⁴

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The issue of substitution is discussed in Chapter 3.

TABLE 6-12
COMPARISON OF ROUND I AND ROUND II BUDGET SHARES,
ALL LOCALITIES

	<u>Round I</u>	<u>Round II</u>
Education	19.1	14.0
Highways	11.0	15.6
Health & Hospitals	3.0	3.5
Sewerage	10.5	9.3
Local Parks & Recreation	10.3	13.7
Natural Resources	1.0	0.8
Housing & Urban Renewal	0.7	1.1
Transport & Transit	1.4	1.6
Utilities (All)	11.9	10.6
Water	8.5	6.2
Electric	0.1	0.4
Other	31.1	29.8

Impact of the LPW Program by Type of Locality

The priorities for allocating LPW funds among different classes of government are obscure.¹⁵ Nevertheless a clear reason for channeling the assistance to the construction industry through state and local governments is the need, or fiscal distress, of those jurisdictions. In analyzing the allocation of LPW funds among different types of jurisdictions, we will therefore assess the impact relative to the needs of different types of localities.

One can distinguish between the needs of state governments and local governments fairly easily. States have a degree of sovereignty which localities do not possess. While there were major fears of some local government bankruptcies the wake of the 1974 recession, few persons thought that any states (other than perhaps New York) were in serious jeopardy. Also, revealed preferences, as demonstrated by a huge increase in state grants-in-aid to localities, indicate that state legislators believe localities to have more pressing needs than the states. During the period 1966 to 1976, state grants-in-aid increased 224 percent approximately 20 percent per year. During the period 1973 through 1976 these grants increased 34 percent, or approximately 10 percent per year, despite the much higher base. The relative funding of the LPW program was clearly consistent with this difference in relative needs. States received only \$0.5 billion of the \$6.0 billion which was distributed to state and local governments as a whole.

Assessing the relative needs of the various types of local governments is far more difficult. A vast amount of diversity exists between the powers, responsibilities, and needs within each of the classes of local government. This diversity primarily exists between -- but also often even within -- the states. Also, it should be recognized that the states have the ability to shift powers, responsibilities, and funds between the various subdivisions in its domain.

Existing data which describe local government finances provide some -- although hardly an overwhelming -- indication that municipalities were more in need of counter-cyclic assistance than other classes of local government during the period of, and immediately before, the LPW program. From the period 1972/73 to 1975/76, the outstanding debt of counties grew 31 percent while the outstanding debt of

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In Section 108(b) of the Local Public Works Capital Development and Investment Act of 1976 "priority and preference" is given "to public works projects of local governments." In the Public Works Employment Act of 1977 this is amended to give the same "priority and preference to any public works project requested by a State or by a special purpose unit of local government...(or) by a school district."

municipalities and townships grew only 23 percent. This would seem to indicate that counties were more expansion oriented than municipalities and townships.¹⁶ This tends to be corroborated by data collected from the outstanding debt and interest payments of localities (Table 6-13) which show that the interest rates paid by cities grew more than those paid by counties. This also indicates that the 1974-75 recession may have had a more serious impact upon cities than counties. Nevertheless, in terms of absolute levels, the average interest rates paid by counties remained above the average rate paid by municipalities.

Several other bits of information can be gleaned from Table 6-13. First, townships, which appeared to pay an interest rate penalty relative to municipalities in 1972/73, seemed to face less cyclic pressure, and in fact achieved parity with municipalities by 1975/76. Second, special districts seemed to face the least cyclical pressure, as measured by interest rates. Third, school districts seemed to face considerable pressure, although less than that of municipalities, despite a limited need for expansion.

There is doubt, however, about whether locality type is the relevant distinction for identifying relative needs. An analysis of local government interest rates by rating class indicates that a fairly wide (25-30 percent) disparity in interest rates between AAA and Baa rated bonds existed until the early 1960's when it dropped in half and remained at the lower level through 1974. After 1974 the differential climbed sharply back to the level of the early 1960's before receding again in 1977. Apparently in 1974 investors began to perceive the relative risk of investing in lower rated local government securities as having increased substantially. To the extent that this change in perceptions occurred, it would significantly increase the fiscal distress of localities which had allowed their bond ratings to deteriorate. This suggests that the increased cyclic fiscal distress, rather than being a locality class phenomenon, may have been related to the past fiscal practices of individual localities, regardless of their class of government.

At first one might assume that data on the relative surplus positions of the classes of local governments would provide considerable information concerning cyclical distress. However the ambiguity of interpretation noted earlier when discussing local governments as a whole, as well as possible aggregation problems, makes these data difficult to interpret.

During the period 1972/73 to 1975/76, the net surplus position of counties fell from \$3.8 billion to \$1.5 billion. At the same time the surplus position of municipalities increased from a deficit of \$0.5 billion to a surplus of \$2.5 billion. The interest rate data presented above would seem to indicate that many municipalities felt a need to improve their fiscal situation. However, the level of the surpluses would also seem to indicate that the cyclic fiscal distress of some municipalities is quite limited. The position of school districts, perhaps as a result of strict budget requirements, consistently showed a modest surplus.

¹⁶ The outstanding debt of school districts grew only 1 percent, presumably a reflection of the reduced demographic pressure for school expansions.

TABLE 6-13
SELECTED IMPLICIT INTEREST RATES BY CLASS OF LOCALITY
(percentage points)

	1972/73	1975/76	Difference
County	3.9	4.4	.5
City	3.1	3.9	.8
Township	3.6	3.9	.3
Special District	2.7	2.9	.2
School District	4.3	4.8	.5

Another indicator of cyclic distress is the growth in public welfare expenditures. For municipalities public welfare expenditures grew 32 percent while for counties, the growth was a more modest 12 percent. Nevertheless, public welfare expenses still remain more than twice as large a percentage of total expenditures for counties as for municipalities.

Data on total expenditures can be useful for comparative purposes. First, the level of total expenditures provides a measure of the relative responsibilities of the classes of locality. Second, the change in total expenditures may provide a measure of the growth of the classes of locality. The data on locality expenditures are presented in Table 6-14. In terms of size of budget, cities would appear to be slightly smaller than school districts but approximately 50 percent larger than counties. The growth rates of the three major classes of governments are not very dissimilar, although the relatively low growth in the expenditures of municipalities may be indicative of relatively great fiscal distress.

The LPW funding levels by class of governments are shown in Table 6-15. Cities received more than 4 times as much money as either counties or school districts, despite the fact that expenditures by cities are only 50 percent larger than counties' expenditures and are slightly smaller than school districts' expenditures. In the case of school districts, this disproportionate funding may be appropriate. School district expenditures have grown rapidly despite a sharp decline in the need for new school facilities. Furthermore, as a special purpose district, the level of school district funding would seem to be a local political decision amendable to change by the voters, if desired. In fact, one could argue that the level of LPW funding for school districts, which was greater than the level of funding for counties, was relatively high.

In CEAI's judgment, the information available on relative distress by class of government do indicate that counties may have received insufficient funding relative to cities. Per dollar of locality expenditure, cities received 3 times as much aid as counties. The evidence on relative locality distress does not provide a clear indication that cities as a class (as opposed to certain individual cities) faced pressures that were several times as great as those faced by counties.

Perhaps the clearest conclusion from this analysis is that targeting counter-cyclic funds by class of government will always be fraught with difficulties. The degree of cyclic pressure faced by localities must inevitably be more locality specific than locality class specific. For this reason, a targeting mechanism, if one is used, should be directed to individual localities, rather than locality classes.

TABLE 6-14
LOCALITY EXPENDITURES BY CLASS OF GOVERNMENT

	<u>Share of Total Locality Expenditures</u>	<u>Growth in Expenditures</u>
County	22%	43%
City	33%	37%
Township	3%	33%
Special District	5%	39%
School District	36%	41%

TABLE 6-15
LPW EXPENDITURES BY CLASS OF GOVERNMENT

	<u>Billions of Dollars</u>	<u>Percentage</u>
State	\$0.52	8.7
City	\$3.55	59.7
County	\$0.78	13.1
School	\$0.81	13.6
Other	<u>\$0.29</u>	<u>4.9</u>
Total	\$5.95	100.0

CHAPTER 7: INTER-REGIONAL IMPACTS

The geographical distribution of the impacts of government expenditure programs have important policy ramifications, involving issues such as regional economic development, equity, and the reduction of differentials in the level of unemployment. These issues are particularly important for a "targetable" program such as the LPW program. In order to address these issues, CEAI analyzed the impacts of the LPW program on a regional level. This analysis included an estimation of the impacts on both the state and the multi-state regional levels.¹ Some insights gained about local (sub-state) impacts and flows are described, but the primary means of evaluating the geographic impacts at that level is reserved for the separate microeconomic evaluation of the LPW program being undertaken by EDA.

Because the incidence of LPW expenditures are known, and are subject to some degree of legislative control, our analysis has focused on inter-regional flows of expenditures. CEAI first divided the impact of LPW expenditures between construction value added and the materials requirements for each type of construction. The flows of materials purchases across state lines were then traced using the Commodity Transportation Survey results.² These results were then aggregated into inter-state and inter-regional flows of expenditures. A more detailed discussion of the methodology used is presented in Chapter 2. In this chapter the results are first presented and then analyzed for causes and distributional effects. The chapter concludes with a brief discussion of policy implications.

CEAI Findings

Expenditure Flow and Impact Estimates

The state impacts of LPW expenditures, and the inter-state expenditure flows resulting from the LPW program, are presented in Table 7-1. LPW expenditures in the 48 contiguous states are shown in the first column.³ In the second column, CEAI's estimates of inter-state flows of expenditures are summarized as net inflows

¹ There were two basic reasons for carrying out the analysis at the state level and then aggregating to regions. First, part of the analysis consisted of developing new regional definitions on the basis of employment characteristics. (See Figure 2-3 for CEAI's definition of regions.) Since these regions differ from other definitions of regions, the presentation of regional results only would have lead to difficulties of interpretation and comparison with other work. Second, the data the CEAI judged to be most useful were organized on a state-by-state basis.

² Since CEAI found that labor, contractors, and materials distributors come largely from within the state -- and virtually entirely from within the region -- of the project, the flows of materials purchases by distributors from manufacturers are estimated to constitute all of the significant inter-state flows of expenditure.

³ These figures are taken from LPW awards data.

TABLE 7-1

LPW EXPENDITURE, IMPACT, AND FLOWS OF EXPENDITURE
BY STATE
(\$1,000)

<u>State</u>	<u>Incidence of LPW Expenditure</u>	<u>Net Inflow of Materials Expenditure</u>	<u>Net Impact of LPW Expenditures</u>
Alabama	53,439	13,201	66,641
Arizona	81,038	-15,910	65,128
Arkansas	40,330	-7,635	32,695
California	724,583	-22,543	702,040
Colorado	43,120	-9,671	33,449
Connecticut	128,984	-2,253	126,731
Delaware	39,930	-9,180	30,750
Florida	296,287	-67,467	228,820
Georgia	101,909	-13,172	88,737
Idaho	40,779	-10,399	30,380
Illinois	150,983	112,310	263,293
Indiana	62,216	44,866	107,082
Iowa	41,716	-4,722	36,994
Kansas	40,452	-7,312	33,140
Kentucky	46,428	-4,813	41,616
Louisiana	60,550	-3,277	57,273
Maine	40,272	-8,895	31,378
Maryland	99,590	-20,533	79,057
Massachusetts	186,172	-31,090	155,082
Michigan	371,031	-40,390	330,642
Minnesota	47,295	-8,272	39,022
Mississippi	41,554	3,632	45,186
Missouri	52,087	5,098	57,184
Montana	42,976	-8,689	34,287
Nebraska	40,733	-8,161	32,572
Nevada	41,607	-10,374	31,233
New Hampshire	40,103	-8,849	31,254
New Jersey	312,953	8,926	321,879
New Mexico	62,766	-14,562	48,203
New York	727,375	-63,681	663,695
North Carolina	73,438	-14,978	58,460
North Dakota	39,641	-8,352	31,289
Ohio	211,653	139,707	351,361
Oklahoma	67,311	-14,611	52,700
Oregon	85,987	7,614	93,600
Pennsylvania	268,827	126,958	395,785
Rhode Island	49,003	7,324	56,327
South Carolina	43,978	-8,435	35,543
South Dakota	44,537	-10,051	34,486
Tennessee	54,499	-7,352	47,147
Texas	146,290	31,082	177,372
Utah	41,524	-9,772	31,752
Vermont	41,289	-10,358	30,931
Virginia	62,791	-7,783	55,077
Washington	118,020	-2,794	115,226
West Virginia	41,501	-8,427	33,074
Wisconsin	56,551	13,705	70,256
Wyoming	38,794	-9,664	29,129

of expenditures for each state. (An alternative interpretation of this column is net exports of materials.) The impact of LPW expenditures plus net inflows of materials purchases is shown for each state in the third column.⁴

Table 7.2 presents the impacts of LPW expenditures, and expenditure flows resulting from the LPW program on a regional basis. The interpretation of the first three columns is the same as for Table 7-1. The last column shows the percentage increase in impact estimated to occur as a result of inter-regional flows of material expenditures.

Interpretation of Expenditure Flows

The states with the largest net inflows of materials expenditure are Ohio, Pennsylvania, and Illinois, followed by Indiana, Texas, Wisconsin, and Alabama. Indeed, the entire industrial belt from New Jersey to Wisconsin enjoys net inflows of materials purchases. Rural states have the reverse pattern. The entire Midwest Region -- and most of the plains and mountain states -- have net outflows of materials expenditure. So do the states in the South (except for Alabama and Mississippi) and the northern tier of New England states. The degree of industrialization therefore appears to play a major role in the inter-state and inter-regional flows of materials expenditures, with industrialized areas experiencing net inflows of expenditure while rural areas experience net outflows of expenditure.⁵

There are some apparent exceptions to this pattern. The North Atlantic region -- and New York, Massachusetts, and Connecticut in particular -- are net importers of LPW materials, despite being industrial states. The same is true of California.⁶ In order to explore these cases more fully, imports and exports were calculated as a percentage of LPW obligations for these states. The states' shares of LPW funds were also compared with the states' shares of shipments of manufactures. For comparison, the same calculations were made for Illinois, Ohio, and Pennsylvania, the largest net exporting states. The results are shown in Table 7-3.

A comparison of the industrialized net materials importers (California, Connecticut, Massachusetts, and New York) with the control group of net materials exporters (Illinois, Ohio, and Pennsylvania) shows that all of these states have

⁴ Adding net materials expenditure to total LPW expenditure is, of course, not precisely correct since the two expenditures are of different types. However, CEAI believes that this procedure provides a useful shorthand summary of the regional impacts.

⁵ There is some possibility that these results were exaggerated by sample bias in the CTS data. Shipments were sampled by state of origin. In general the non-industrial states were less adequately sampled than the major industrial ones, and in some cases little or no usable data was available. Although the effects are relatively small, this tends to overstate materials exports of industrial states and understated materials exports of rural states.

⁶ Michigan also had substantial net imports, despite being industrialized. In this case, however, the result is less anomalous because the state's major industry -- automotive products -- is not strongly impacted by construction expenditures.

TABLE 7-2
LPW EXPENDITURE, IMPACT, AND FLOWS OF EXPENDITURE
BY REGION

Region	Incidence of LPW Expenditure (\$1000)	Net Inflow of Materials Expenditure (\$1000)	Net Impact of LPW Expenditure (\$1000)	Percent Increase in Impact Due To Expenditure Flows ^a
North Atlantic ^b	2,038,789	-27,842	2,010,947	- 1.4
Great Lakes ^c	1,039,960	257,489	1,297,449	24.7
Mid-South Atlantic ^d	212,245	-38,401	173,845	-18.1
South Atlantic ^e	553,738	-67,082	486,656	-12.1
Midwest ^f	288,801	-62,983	225,817	-21.8
Southwest ^g	1,209,581	-39,305	1,170,276	- 3.2
North Pacific ^h	201,775	-21,882	179,893	-10.8

a) $(100)(\text{Net Inflow})/(\text{Incidence})$

b) Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Virginia

c) Kentucky, Ohio, Indiana, Michigan, Illinois, Wisconsin, Minnesota, Iowa, Missouri

d) North Carolina, South Carolina, Tennessee, Arkansas

e) Georgia, Florida, Alabama, Mississippi, Louisiana

f) North Dakota, South Dakota, Nebraska, Kansas, Wyoming, Colorado, Utah

g) Oklahoma, Texas, New Mexico, Arizona, Nevada, California, Oregon

h) Montana, Idaho, Washington

TABLE 7-3

TRADE FLOWS AND SHARES OF LPW OBLIGATIONS AND SHIPMENTS
FOR SELECTED STATES

State	Imports/LPW Obligations (%)	Exports/LPW Obligations (%)	Share of Total Obligations (%)	Share of Total U.S. Shipments of Manufactured Goods (% of 1972 total)
California	12.7	12.4	12.2	8.3
Connecticut	21.5	19.8	2.2	1.6
Illinois	15.1	90.2	2.5	7.1
Massachusetts	23.3	6.7	3.1	2.5
New York	18.5	9.9	12.2	7.8
Ohio	15.6	82.3	3.6	7.3
Pennsylvania	16.0	64.0	4.5	6.4

about the same propensity to import materials⁷ as a result of LPW expenditures. California has the lowest propensity to import, probably because of its large size and relative isolation. Connecticut and Massachusetts have the highest propensities to import, which one would expect from their small size. Otherwise these states have very similar import patterns. By contrast, a comparison of exports of materials with LPW obligations shows a striking difference between these two groups of states. The net importers of materials have at most only one-third as many materials exports per dollar of LPW funds as the net exporting states. Since these importing states are all relatively industrialized, the likely cause for this pattern is their receipt of a relatively high level of LPW obligations. Indeed, two of the net materials importing states (California and New York) have large absolute shares of LPW funds (over 12 percent each). All four materials importing states have shares of LPW funds that are large relative to their shipments of manufactures. Thus it appears that where highly industrialized states are not importers of materials, the explanation for this phenomenon is large LPW grants rather than a high propensity to import.

Several conclusions concerning the propensity to export materials can be stated. In general, a state or region tends to gain more from the flows of materials purchases resulting from LPW expenditures:

- The more industrialized its economy is.
- The lower its own share of LPW awards is.
- The more central and proximate to markets its location is.

All of these factors were operative in the Great Lakes region, the only region to enjoy a positive net inflow of materials expenditures.

Net Regional Distributional Effects of LPW Expenditures

To gain a complete picture of the net distributional effects of LPW expenditures, the incidence and impacts of those expenditures must be compared with a source of funding. A region has gained (lost) from the program as a whole only if it has received a higher (lower) share than it contributed to the funding. To estimate this effect personal income taxes⁸ were used as a measure of contributions to funding of LPW expenditures. Each region's share of LPW awards, net LPW impact, and personal income taxes are shown in Table 7-4. Ratios of these variables,

⁷

The measure used to represent propensity to import materials is the ratio of the value of materials imports stemming from LPW expenditures to the value of LPW awards.

⁹

Data for corporate profit taxes are not available by state (or region). The basic underlying problem is the difficulty of making meaningful assignments of the profits of a multi-state firm to a given state.

TABLE 7-4

SHARES OF AWARDS, NET IMPACT AND FINANCING OF LPW, BY REGION

Region	Share of LPW Awards	Share of LPW Impact, Including Net Materials Flows	Share of Personal ^a Income Taxes
	(%)	(%)	(%)
North Atlantic	36.30	36.27	31.72
Great Lakes	18.89	23.40	27.69
Mid-South Atlantic	3.86	3.14	5.19
South Atlantic	10.06	8.78	8.98
Midwest	5.26	4.07	4.13
Southwest	21.97	21.11	19.96
North Pacific	3.67	3.24	2.33

a) Source: U.S. Internal Revenue Service, Statistics of Income, Individual Tax Returns, 1974.

computed for comparison,⁹ are shown in Table 7-5.

The Great Lakes Region and the Mid-South Atlantic Region both received substantially less than their tax "share" of LPW awards. Because of its heavy exports of materials, the Great Lakes Region made up, in terms of net impact of LPW expenditures, about half of their awards shortfall. The Mid-South Atlantic Region, however, lost still further ground as a result of materials expenditure flows.

All other regions received above their tax "shares" of LPW awards. The Midwest Region and the North Pacific Region received the greatest ratio of LPW awards to contributions. This is primarily the result of a general pattern of small rural states' receiving proportionately large (although absolutely small) amounts of LPW funds. All of these regions except the North Atlantic Region incurred net losses as a result of materials expenditure flows. The South Atlantic Region and the Midwest Region had their net LPW impacts reduced to slightly below their tax "shares."

When compared to personal income taxes, LPW expenditures do not appear to have a major regional redistributive effect. One distinction that is occasionally hotly contested is that between the Northeast (North Atlantic Region) and the "Sun Belt" (South Atlantic and Southwest Regions). These regions benefit to an equal degree in terms of LPW awards, although the sun belt's share of net impact is somewhat lower. The effect on the regional distribution of impacts of materials expenditure flows is not large.¹⁰ Its effect was fairly consistent to reduce the discrepancies in shares of benefits. The reduction in the discrepancy is particularly noticeable for the Great Lakes Region. Only for the two

⁹ The ratio of Share of Awards to Share of Taxes and the ratio of Share of Net Impact to Share of Taxes both measure the degree of regional gain (loss) from the program. Values in excess of unity show a net gain; the larger the value, the larger is the gain. The ratio of Net Impact to Awards measures the degree of gain from the flows of materials expenditures. Again, a value greater than unity shows a net gain and the larger the value, the larger the gain.

¹⁰ The largest net regional outflow of materials expenditures is 23 percent of LPW awards. The average net outflow, weighted by LPW awards (excluding the Great Lakes Region), is about 5 percent of LPW awards. Regional shares of LPW awards, net impact of LPW, and personal taxes are extremely highly correlated, and state shares are almost as highly correlated:

Correlation Coefficients Between

	<u>Awards & Net Impact</u>	<u>Awards & Taxes</u>	<u>Taxes & Net Impact</u>
By Region	.988	.938	.978
By State	.969	.900	.909

TABLE 7-5
COMPARISON OF AWARDS, NET IMPACT, AND FINANCING OF LPW, BY REGION

<u>REGION</u>	<u>SHARE OF AWARDS SHARE OF TAXES</u>	<u>SHARE OF NET LPW IMPACT SHARE OF TAXES</u>	<u>NET IMPACT AWARDS</u>
North Atlantic	1.14	1.14	1.00
Great Lakes	.68	.85	1.24
Mid-South Atlantic	.74	.60	.81
South Atlantic	1.12	.98	.87
Midwest	1.27	.97	.77
Southwest	1.10	1.05	.96
North Pacific	1.57	1.39	.89

smallest regions¹¹ does the regional share of net impact of LPW expenditure differ from the regional share of personal income taxes by more than 15 percent.

Local Targeting of LPW Impacts

CEAI's research efforts focused on the issue of inter-regional effects, not local flows of expenditure. The field experience that was gained nevertheless produced some observations about the efficacy of targeting expenditures on small pockets of unemployment. In general it does not appear feasible to target on a geographical area smaller than a city or county. The major reason for this conclusion is that LPW funds flowed through previously established local channels and through the market mechanism. Projects were bid on competitively and contractors obtained labor by their own means. If a contractor was unionized, the union hiring hall was used. Contractors tended to have preferred materials distributors. All these factors tend to diffuse the geographic impacts of LPW expenditures. Even when all inputs are procured locally, this typically means at least a 10 to 20 mile radius. Targeting impacts within a smaller area does not appear possible with a construction grants program unless many additional requirements are to be imposed.

Policy Implications

Inter-regional flows of construction and materials expenditures do exist with a program such as the LPW program. While these flows of expenditures are confined almost exclusively to materials expenditures, they are fairly substantial. Materials expenditures tend to flow from relatively non-industrialized regions to industrialized regions. For future programs regional exports and imports of materials should be considered in estimating impacts. If this is done, the implication of the preceding analysis is that non-industrialized areas should be given a larger share of funds (perhaps 20-25 percent larger) than their intended ultimate share of program impact. In practice, this was done in some cases of the LPW funding.

Expenditure flows also tend to reduce the efficacy of targeting awards on a geographical area. The smaller the area is, the greater will be the leakage. On a regional level this leakage appears to have reduced, by about half, the degree to which the regional share of LPW grants differed from the shares of personal income taxes. At the state level, the loss of specificity in targeting is somewhat larger, although the exact amount will vary with the degree of industrialization and the geographic position of the state with respect to markets. For geographical units smaller than a city or county, the loss of the targeting effect appears to be nearly complete.

¹¹

The Mid-South Atlantic and North Pacific Regions contain only seven states, and they received only 6.4 percent of LPW awards. Only in the case of the Mid-South Atlantic Region did inter-regional material flows increase the discrepancy between LPW awards and taxes.

CHAPTER 8: OTHER POLICY ISSUES

In carrying out its tasks under this project CEAI gathered information relating to the success of LPW in meeting policy goals other than construction-related employment creation, industry stimulus, local government assistance and geographic targeting. These other goals include counter-cyclical timing, maintenance of construction industry wages at satisfactory levels, minority assistance, the creation of social infrastructure and the creation of continuing employment as a result of the increased social infrastructure. The effectiveness of the LPW program as counter-cyclical policy is a significant issue for the macroeconomic evaluation, and it was a major focus of CEAI's analysis. Another policy issue of considerable importance is the extent to which the LPW acted to increase the rate of inflation. The other issues, however, are properly topics to be included in the microeconomic evaluation, which is being conducted by EDA. CEAI made no systematic analysis of these issues, and the observations on these latter topics should be thought of as merely indicative.

The LPW Program as Counter-Cyclical Policy

LPW Program Timing

The LPW program was designed to be a brief, sharp injection of funds into the construction industry. The legislation set a maximum of two quarters for implementation,¹ and expenditure was to be completed in another five quarters. Round I funds (\$2 billion) were appropriated on October 7, 1976. LPW expenditures effectively started in early 1977. Approximately 20 percent of the total \$6 billion in expenditures that was eventually authorized was actually spent in that year. As Round II projects commenced and many of the projects reached their most intensive stage of construction, LPW expenditures rose to a peak in mid 1978. Approximately 61 percent of all LPW expenditures are estimated to take place in 1978. During 1979, LPW expenditures are estimated to drop off steadily, with about 18 percent of expenditures estimated to take place. Only a small trickle of LPW expenditures -- about 1 percent -- is estimated to occur in 1980. The expenditures are shown by round in Table 2-2. The purpose of this section is to compare these expenditures with the cyclical character of the economy.

¹ This time period does not make specific allowances for applications. It was assumed that LPW projects would be readily available, so that minimal time would be required in making applications. Expenditures did, in fact, begin to be made within two quarters of the appropriation of funds.

Table 8-1 shows the timing of major LPW events in relation to the most recent NBER reference cycle. Time is measured in quarters, beginning with the NBER reference peak in 1973.4. The NBER reference trough occurs in the fifth quarter after this peak. The average length of the previous four expansions is used as a proxy for the next peak.² LPW events include the appropriation of each round, and the initiation, peaks, and termination of expenditure flows. The LPW program chronology reveals the following features:

- LPW expenditures began three years after the NBER reference peak and nearly two years after the NBER reference trough.
- LPW expenditures reached a peak roughly one year before economic activity is likely to peak and turn downward.
- LPW expenditures will decline steadily during the period in which an economic downturn may be expected to occur.³

Thus, rather than being counter-cyclical, the expenditure pattern of LPW program enacted in 1976 and 1977 is pro-cyclical.

From the NBER reference peak to the estimated completion of LPW expenditures is a period of nearly seven years. In Table 8-2 the time requirements of the LPW program are described. Most of the time preceding the impact of LPW expenditures was consumed by various lags. The "identification lag" alone was two years. This lag has several components. First the fact of a recession must be confirmed, which may take several months. In 1973-74 the identification and confirmation of the recession was exceptionally complex. Next the industries which were particularly severely affected (e.g. construction) must be identified, and programs must be devised. Finally, sufficient political support must be generated to enact necessary legislation. All these delays are typical of discretionary counter-cyclical fiscal policy, although they may have been somewhat more prolonged than usual in the case of the LPW program.

Delays, however, did not stop with the passage of the original local public works legislation. First, President Ford's veto of HR 5247 delayed the program another two quarters. Then three more quarters passed before the legislative support strengthened to the point of passing Round II. Of the thirteen quarters which elapsed between the economic downturn and appropriation of Round II, probably half of the delay was attributable solely to difficulties in making the final policy decision expeditiously.

² This means of estimating the next peak in economic activity is admittedly a very rough procedure, especially since the 1961-69 expansion was twice as long as the average. The resulting estimate nevertheless had great plausibility for two reasons. First, this is an estimate that is easily understood and was readily available during the debate to approve the LPW program. Second, many current economic forecasts -- including CEAI's own -- predict a strong possibility of an economic downturn in 1979. This timing coincides with the much cruder estimate of the next economic peak.

³ CEAI's forecast, among others, is relatively optimistic for the 1980s.

TABLE 8-1
LPW CHRONOLOGY

<u>Year</u>	<u>Quarters from 1973 Peak</u>	<u>Event</u>
1974	1	
	2	
	3	
	4	
1975	5	NBER Reference Trough
	6	
	7	
	8	
1976	9	
	10	
	11	Round I Appropriated
	12	
1977	13	Round I Expenditures Begin
	14	Round II Appropriated
	15	Round I Expenditures at Maximum
	16	Round II Expenditures Begin
1978	17	
	18	Overall LPW Expenditures at a Maximum; Round II Expenditures at a Maximum
	19	
	20	
1979	21	Average Length of Previous Four Expansionary Cycles
	22	
	23	
	24	Round I Expenditures Estimated to End
1980	25	
	26	
	27	Round II Expenditures Estimated to End
	28	

TABLE 8-2
TIME REQUIREMENTS OF LPW PROGRAM

Program Lags

Identification Lag ^a	8 Quarters
Presidential Veto ^b	2 Quarters
Round II Decision ^c	3 Quarters
Time Over-run ^d	7 Quarters
Total Lags	<u>20 Quarters</u>

Program Duration

Implementation of Program ^e	2 Quarters
Expansion to Maximum Expenditure	2 Quarters
Winding Down to Completion ^f	3 Quarters
Total Program Duration	<u>7 Quarters</u>

- a) Elapsed time from NBER reference peak to passage of HR 5247.
- b) Elapsed time from Senate sustaining of veto of HR 5247 to House override of veto of PL 94-369.
- c) Elapsed time from completion of Round I project selection to completion of Round II project selection.
- d) Elapsed time from legislative completion date (December 1978) to CEAI's estimated completion date (September 1980).
- e) This includes a 30-day period for promulgation of rules, a 60-day period for ruling on applications, and a 90-day period to get labor on site.
- f) The completion date is based on elapsed time between Round II Appropriations and the Round II stated completion date of December 31, 1978.

The final factor in the long life of the LPW program is the fact that duration of the expenditures is estimated to be 7 quarters longer than was foreseen in the legislation.⁴ Perhaps one quarter of this is attributable to the fact that the 90-day requirement for on-site labor was met in form only for many projects. The size of projects is another major factor, even though the funded projects were, on average, quite small. The average sized LPW project required more time to complete than was projected in the appropriating legislation. A possible failure to recognize the degree to which construction slows during the winter months may also explain some of the delay. Finally, previous delays may have played a part in the time over-run, in that, as the economy reached a more exuberant phase of the cycle the pace of all construction tends to slow.

The LPW legislation designed a concise program of expenditure. Yet three factors -- the process of identifying the problem, the growth of political pressure for this type of program, and the excess of actual construction time over that envisioned in the legislation -- each added to the elapsed time an amount roughly equal to the conceived duration of the program. These delays are primarily responsible for the pro-cyclical nature of the expenditure. At least three years of the delays -- the presidential veto, the elapsed time between Round I and Round II, and the time over-runs -- appear to be singularly related to the LPW program itself.

LPW Expenditure Timing And Employment

When compared to the movement of the unemployment rate, LPW expenditures are, if anything, even less counter-cyclical than they appear in relation to the NBER reference cycles. Unemployment peaked at just over 9 percent in May 1975 (see Figure 4-1). It fell below 8 percent in January 1976 -- shortly before President Ford vetoed HR 5247 -- and it first reached 7.5 percent in May 1976 -- two months before President Ford's second veto was overridden. The 7 percent floor on the unemployment rate was finally broken in August 1977 -- shortly before Round II expenditures began. Unemployment reached 6 percent in April 1978 -- shortly before the peak of LPW expenditures -- and it has remained at that plateau since.⁵ CEAI forecasts, however, that the unemployment rate will begin to rise -- coincident with the tapering off of LPW expenditures -- during 1979.

The timing pattern with respect to construction unemployment is much the same. The 1975 unemployment peak, however, was much higher (21 percent), the decline was much sharper (to 9.2 percent), and the construction unemployment rate has already risen by 1.5 percent since the peak period of LPW

4

Three quarters of this time is an extremely small trickle of expenditure estimated to occur in 1980. In a sense, this overstates the time over-run, because the expenditure is so small. Nevertheless, the period involved is already past the likely date of a possible economic downturn. Thus shortening the estimated time over-run to four quarters does not affect the nature of the relationship between the timing of the business cycle and the timing of LPW expenditure.

5

Estimated total employment generated by the LPW program was -- at its maximum -- only about 0.1 percent of the labor force. Thus the pattern of changes in the unemployment rate was not significantly influenced by the LPW expenditures themselves. However, to the extent that the LPW program was part of a wider fiscal stimulus effort, it is fair to conclude that the impact of the total program helped to make one aspect of it -- LPW expenditures -- more pro-cyclical.

expenditures. Thus, for both the economy as a whole and for the construction industry, LPW expenditures began well after the peak of unemployment and thereafter move inversely with the unemployment rate.

As noted in Chapter 2, the delayed timing of LPW expenditures also contributed to the dilution of the impact of LPW expenditures. Had the program taken place three to four years earlier, employment would have been over a third higher: Crowding out would have been reduced by nearly 25 percent, and at least 15 percent more employment would have been generated per dollar because of greater purchasing power and lower labor productivity.

LPW Expenditure Timing and Industry Impacts

The LPW program did not have a significant counter-cyclical impact on material supply industries. As was noted in Chapter 5, the impact on any single industry was "too little" to provide major relief for the cyclic distress of that industry and "too late" to benefit industries at the time of their cyclic distress. The date of the peak and trough of constant-dollar value of shipments is shown for each impacted materials industry in Table 8-3. This table also shows two measures of industry recovery -- the year in which shipments surpassed the previous peak, and the 1978 shipments as a percentage of the previous peak's shipments.

Of the 36 industries impacted by LPW expenditures, 34 had reached their trough in 1975--over a year before LPW expenditures began. Nearly half (15) had regained their previous peak by 1976 -- before LPW expenditures began, and 75 percent had achieved that level by 1977 -- before LPW expenditures peaked. In 1978, the year of peak LPW expenditures, shipments for these industries averaged 6.7 percent above the level of the previous peak.⁷ In that year only 6 industries had not yet reached the previous peak, and they were not greatly aided by the LPW program.⁸ In general, LPW expenditures did no more than add very slightly to demand for these industries

⁶ At its maximum (for only one quarter) employment attributed to the LPW program is only about 1 percent of construction employment. Movement of the construction industry unemployment rate is therefore not substantially influenced by LPW expenditures themselves.

⁷ The contribution of LPW expenditures to this excess above the previous peak was small. In only a very few industries (Cement & Clay Products, Plumbing & Heating Equipment, Structural Metal Products, and Light & Wiring Equipment) was the impact over about 0.3 percent of production. The largest degree of impact was about 1.2 percent of shipments.

⁸ For these industries, the maximum (1978) impact of LPW expenditures averaged 0.37 percent of shipments. Only in one case (Cement & Clay Products, with an LPW impact of 1.2 percent of shipments) was the impact greater than 0.5 percent of shipments.

TABLE 8-3

Timing of Materials Supply Industry Recession and Recovery

Industry	Date of Previous Peak	Date of Trough	Date of Recovery to Previous Peak	1978 Shipments Relative to Shipments at Previous Peak (%)
Agriculture	1973	1974	1976	1.14
Mining	1972	1977	a	.93
Floor Coverings	1973	1975	1977	1.12
Textiles & Apparel	1973	1975	a	1.00
Lumber	1973	1975	1977	1.02
Wood Products	1973	1975	1977	1.11
Furniture	1973	1975	1977	1.09
Paper Products	1973	1975	1976	1.10
Paints	1973	1975	1977	1.10
Chemical Products	1974	1975	1976	1.10
Petroleum Products	1973	1975	1977	1.08
Rubber Products	1973	1974	1977	.99
Plastic Products	1973	1975	1976	1.23
Leather Products	1974	1978	a	.93
Glass	1973	1975	1976	1.06
Cement and Clay Products	1973	1975	a	.96
Iron and Steel	1973	1975	1976	1.04
Nonferrous Metals	1973	1975	a	1.00
Fabricated Metal	1973	1975	1976	1.09
Plumbing and Heating Eq.	1972	1975	a	.87
Structural Metal Products	1973	1975	1978	1.03
Metal Stampings	1973	1975	1977	1.04
Engines and Turbines	1974	1975	1976	1.07
Const., Mine, Mater. Hdq.	1974	1975	1977	1.08
Misc. Non-Elec. Mach.	1974	1975	1976	1.10
Serv. Indus. Mach.	1973	1975	1976	1.24
Trans. & Switch	1974	1975	1977	1.09
Appliances	1973	1975	1978	1.01
Light & Wiring Eq.	1973	1975	1978	1.03
Communication Eq.	1973	1975	1976	1.12
Elec. Mach, NEC	1974	1975	1976	1.18
Trans. Commodities	1973	1975	1977	1.03
Instruments	1973	1975	1976	1.10
Misc. Manufacturing	1973	1974	1977	1.07
Trans. Services	1973	1974	1976	1.13
Wholesale & Retail Trade	1973	1974	1976	1.14

a) Does not recover to previous peak.

after the recovery had been accomplished.⁹

Potential Counter-Cyclical Impact

A large portion of the delay in implementing the LPW program is due to the political decision-making process rather than lags inherent in the program itself. For example the actual appropriation of Round I funds, did not occur until three years after the onset of the recession. For the purposes of policy analysis, it is useful to estimate the impact of an LPW type program which started as soon after the recession as possible. It is, of course, impossible to eliminate the identification lag entirely, but it is reasonable to ask what would have happened if the LPW program had started 90 days after the earliest identification of the 1973-1975 recession.

Determination of the date of earliest possible identification of the recession is never easy, but it is particularly difficult for the 1973-1974 recession due to the great uncertainty among economists and businessmen as a result of the oil embargo. Nevertheless, with the quadrupling of oil prices in January, 1974, it should have been clear that a problem existed, even though the importance of the oil price increase was not generally recognized, and the coming agricultural crisis was, of course, unforeseen.¹⁰ With 1974.1 considered as the date of earliest possible identification of the downturn, simulation of an LPW type program starting 90 days after the earliest possible identification thus begins in 1974.2. For comparison, a simulation was also made of the LPW program beginning in 1975.1 -- 90 days after most commentators conclusively identified a serious downturn in 1974.4.¹¹

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The impact of LPW expenditures on the materials supply industries may have been even later than the expenditure peak in 1978.2 suggests. CEAI did not include estimates of the lag structure of the ripple effect of derived demand as it spread through the economy.

¹⁰ CEAI had been warning of a peak in 1973 and a recession in 1974 for several years, and in 1974 warned that "not only is the recession here, but it will stay with us for the rest of the year." By contrast Fortune's respected "Business Roundup" argued in July, 1974 that "By Comparison with the past eighteen months, the next eighteen will seem almost sunny... the growth of real GNP should continue as a 3 percent rate the rest of this year and move up toward 4 percent during 1975." As late as September, 1974, "Business Roundup" suggested that there was only a risk--"by no means probable--that the U.S. will sink into a severe recession."

¹¹ In the simulation the actual timing of the LPW expenditures was used, i.e. a \$2 billion Round I was followed by a \$4 billion Round II 3 quarters later. CEAI believes that this procedure makes adequate allowance for any uncertainties about the seriousness of the recession prior to the second half of 1974.

Two versions of the 1974.2 simulation were run. The first injected \$6 billion of LPW expenditure in current dollars; the second used the deflated real value equivalent of the LPW expenditures. Employment impacts for the construction industry are summarized in Table 8-4, and total employment impacts are summarized in Table 8-5.¹² Employment in the current dollar simulation is over 20 percent higher than for the Deflated 1974.2 simulation. The difference between this result and the Deflated 1974.2 result (described below) reflects the decline in purchasing power of \$6 billion in the intervening 11 quarters.

Construction employment for the Deflated 1974.2 simulation is nearly 9 percent higher than that which occurred in the actual LPW program. Total employment is 13 percent greater than that which occurred in the actual LPW program. This implies increases of approximately 16 percent in the generation of non-construction employment. During the first four quarters of the Deflated 1974.2 simulation, real GNP was projected to increase by 0.8 billion,¹³ which is 15 percent more than the increase attributed to the actual LPW program. In the next four quarters the simulated increase in GNP was 2.4 billion, 10 percent greater than the effect of the actual LPW program. The total increase in real GNP as a result of the Deflated 1974.2 simulation was \$3.9 billion, which is 11 percent more than the 3.5 billion increase which is estimated to have resulted from the actual LPW program.¹⁴

Other differences between the Deflated 1974.2 simulation and the actual LPW program also exist. While the actual LPW program was estimated to have a very slight inflationary impact beginning in the third year, the Deflated 1974.2 simulation, if anything, tends to lower prices by a miniscule amount by reducing the decline in labor productivity. Similarly, although impacts on three month Treasury Bill rates are virtually identical for the two simulations, the Deflated 1974.2 simulation has a marginally, but pervasively, smaller effect on long term interest rates than does the actual LPW program.

¹² The data in Tables 8-4 and 8-5 extend for 11 quarters only. The twelfth quarter of the 1974.2 simulations is, of course, 1977.1, which is the first quarter of actual LPW expenditure. Since the baseline for 1977.1 thus includes the actual LPW program, it was necessary to subtract actual 1977.1 expenditures from the hypothetical twelfth period expenditures of the 1974.2 simulation. Thus the twelfth period of the 1974.2 simulation cannot be compared to the twelfth period of the actual LPW program simulation.

¹³ This value and subsequent values of GNP change are measured in constant 1972 dollars.

¹⁴ The 1974.2 simulation in current dollars produced increases in real GNP that were 30 percent higher than those resulting from the actual LPW program.

TABLE 8-4

CHANGE IN CONSTRUCTION INDUSTRY EMPLOYMENT
(Persons Employed)

<u>Program Quarter</u>	<u>Actual LPW Program</u>	<u>\$6 Billion 1974.2 Program</u>	<u>Deflated 1974.2 Program</u>
1	300	300	300
2	1,200	1,500	1,300
3	1,800	2,300	2,000
4	3,100	3,800	3,300
5	4,700	5,500	4,800
6	7,100	8,800	7,500
7	6,900	8,800	7,500
8	6,800	9,000	7,500
9	6,000	8,000	6,800
10	4,600	6,800	5,300
11	2,800	4,500	3,300
TOTAL	45,300	59,300	49,600
(first 11 quarters)			

TABLE 8-5

CHANGE IN TOTAL EMPLOYMENT
(Persons Employed)

<u>Program Quarter</u>	<u>Actual LPW Program</u>	<u>\$6 Billion 1974.2 Program</u>	<u>Deflated 1974.2 Program</u>
1	300	300	300
2	2,000	4,000	4,000
3	4,100	5,800	5,800
4	8,100	11,500	9,500
5	12,600	15,300	13,300
6	17,100	23,000	19,300
7	19,400	25,300	21,500
8	19,500	25,500	21,500
9	17,400	23,800	17,800
10	13,100	20,000	14,000
11	8,800	14,000	8,000
TOTAL	122,400	168,500	135,000
(first 11 quarters)			

The major reason that the estimated impact of the Deflated 1974.2 simulation is greater than that of the actual LPW program is that the earlier simulation occurs at a more propitious time of the business cycle. Because the expenditure started during the recession and wound down when the economy recovered, crowding out and other adverse effects such as inflation and interest rate impacts were minimized or prevented entirely. Furthermore, under the 1974.2 simulation employment and GNP impacts occurred when they were needed most. This simulation produced truly counter-cyclical results.

The 1975.1 simulation was run with a deflated expenditure equivalent to the actual \$6 billion LPW expenditure. In this simulation, however, it was assumed that the total expenditure was made at one time rather than in two rounds.¹⁵ In terms of total impact upon real GNP and employment, the results of this simulation were quite similar to the Deflated 1974.2 simulation. Thus it appears that the benefits of counter-cyclical policy could have been achieved if the program had been initiated in early 1975, when the recession was universally acknowledged. This result is hardly surprising. The 1974 recession was particularly long and unusually severe. Virtually all of the direct stimulus of the single phase 1975.1 program occurs in 1975 and 1976, well before the factor markets began to show the first evidences of tight conditions.

Policy Implications of LPW Program Timing

The timing of the LPW program was such that it was not an effective counter-cyclical policy tool. The program began after the recovery was well under way, achieved its peak impact at a time of relatively exuberant economic activity, and will find down during a time when there is danger of an economic downturn.

Time is critical for counter-cyclical expenditures. Yet, prior to its enactment, debate over LPW consumed well over a year, and perhaps as much as two. This delay was critical in terms of the counter-cyclical efficacy of the program. It would seem to further the goals of discretionary counter-cyclical expenditure programs if their proponents either carried the day immediately and overwhelmingly or lost the fight entirely. Unfortunately the political process, which requires that the problem becomes generally obvious, seriously complicates all federal efforts for effective counter-cyclical policy. Nevertheless, the CEAI simulations do indicate that if action is taken promptly its effectiveness could have been enhanced. A list of the post war recessions and an indication of their duration is given in Table 8-6. Although the 1973-1975 recession was the longest of the post war recessions, the difference in duration is surprisingly small. Since the earlier recession was not obfuscated by the oil embargo it is likely that the shorter duration of the

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The purpose of these simulations is to assess the effect of the LPW program in the absence of delays due to political decision-making. The two-round program simulated in 1974.2 seems appropriately to reflect some degree of uncertainty that existed during 1974 (see footnote 10). By the end of 1974, however, the extent of the recession and the need for the LPW program were clearly known. Thus abstraction from political decision-making implies implementing the entire \$6 billion program in 1975.1.

TABLE 8-6

DURATION OF POST-WAR RECESSIONS AND RECOVERIES TO PEAK

<u>Cycle</u>	<u>Duration^a</u>
July 1953 - March 1955	21 months
February 1957 - February 1959	25 months
January 1960 - November 1961	23 months
October 1966 - October 1967 (growth recession ^b)	12 months
September 1969 - January 1972	29 months
November 1973 - May 1976 ^a	31 months

a) Time elapsed between the peak in manufacturing activity and the reattainment of the peak level of production.

b) A local peak occurred in June 1974, but the recession continued until May 1976.

recessions would be offset by an earlier identification. Thus the possibility of an effective counter-cyclical works program exists, although unless the political action is exceptionally prompt this possibility is relatively small. This does not necessarily support a standby public works program, since other issues must be considered, including: (a) the possibility of increased "project delay" substitution; (b) the planned size of the program; (c) the possibility of a recession which impacts construction mildly; (d) the size and type of projects and (e) the possibility of false indications of a recession triggering the program must first be considered.

The design and implementation of the LPW program also contributed the delays. The time limits on steps of implementation appear to have worked reasonably well in terms of elapsed time, although there was considerable slippage in getting labor on site. The multiplicity of goals and selection criteria, however, were complex and led to results that were not wholly satisfactory, adding to the pressures for Round II. The greatest timing shortcoming of the actual program was that effective control over the termination of expenditures was lost. Thus the program is continuing well beyond the expected period, and the impact is correspondingly delayed. Ideally the program would wind down in the strongest part of the recovery.

Davis-Bacon Requirements

The Davis-Bacon requirement is designed to remove the incentive that contractors might otherwise have to "import" low cost labor from other regions. The requirement does, of course, raise the costs of LPW projects. CEAI included questions on this effect in its survey of LPW contractors. The results are shown in Table 8-7. Based on CEAI's sample Davis-Bacon requirements raised wages for slightly under half the LPW contractors. The tendency for Davis-Bacon requirements to raise wages was markedly higher among non-union contractors than union contractors.

The survey also produced some evidence that Davis-Bacon requirements (and/or high wages) affect the skill mix of labor. In response to a question on the effect of Davis-Bacon requirements on hiring practices, two union contractors responded that, since they had to pay higher wages anyway, they took care to employ highly skilled workers. Three non-union contractors noted (with pride) that they had skilled employees and paid them well. This tends to suggest that Davis-Bacon requirements raise the skill mix of LPW work forces.

TABLE 8-7
SAMPLE OF DAVIS-BACON EFFECTS^{a)}

<u>Effect on Wages</u>	<u>Union Status of Respondent</u>		<u>Total</u>
	<u>Unionized</u>	<u>Non-unionized</u>	
Raise Wages	3	8	11
No Effect	9	7	16
Total	12	15	27

a) Source: CEAI Survey of LPW Contractors

Higher wages reduce the employment that can be generated per dollar. Skilled labor reduces to quantity of labor required for a given project. Both effects tend to lessen the employment impact of the LPW program. CEAI's employment estimates, which used average labor requirements, took no account of Davis-Bacon requirements. Since these requirements, if they have any effect, appear to reduce the employment impact, this effect re-enforces CEAI's judgment that our employment estimates have not tended to understate the LPW program's employment impact.

The Value of LPW Projects

Ideally, the LPW program would be composed of those projects for which localities thought the need was pressing but not sufficiently pressing to be worth financing locally. If higher priority projects were selected, the problem of substitution would arise; if lower priority projects were chosen, the social welfare would not be maximized.

Attempts to explore the question of the usefulness of public works projects often lead to an endless discussion as to whether or not there is a shortage of public infrastructure. A person's opinion on whether or not there is a shortage of public infrastructure clearly depends upon the person's own particular preference function. Until recently it was often argued that the lack of a market system for public goods and/or competition between localities to attract businesses produced a less than optimal level of public infrastructure.¹⁶ Indeed, the apparent lack of local government resources for "essential" projects forms a major link in the justification of the program as expressed in Section 201 of the 1976 act. However, recent political actions, including the success of Proposition 13 in California would seem to indicate that the view that public services are underprovided is by no means unanimous.

One can avoid becoming embroiled in this argument by noting that the LPW program could easily have increased the country's welfare even if there were no projects whose value exceeded their cost. The reason for this apparent paradox is simply that the benefit of the achievement of other social goals including employment creation must be added to the benefit of the project, before comparing the project's benefit to its cost. If this procedure were not followed, one might take the absurd position of rejecting useful construction projects because their direct benefits were slightly lower than their costs while deciding to finance totally unproductive employment programs to aid the unemployed.

CEAI's survey indicates clearly that in most cases LPW funds were used for projects which were generally desirable but of less than the highest priority. This finding supports our conclusion that substitution was only 20 percent of total funding as well as the view that LPW projects were not "make work" operations. Many cases existed in which it seemed unlikely that local funds could be raised for the purpose. Many of the projects (such as new municipal buildings)

involved issues of direct concern to locality employees while many others (such as construction activities designed to increase the efficiency of local government operations or to provide for recreational services) were without broad active constituencies. The types or projects included renovations of existing buildings to reduce maintenance expenses, the establishment of retail centers, road construction and repair, the construction of municipal facilities of all types, and recreational facilities. In virtually all cases in which substitution did not appear to be a factor, the projects appeared useful but it is unknown whether or not the projects were cost effective. Indeed, CEAI found little evidence of the use of cost/benefit analysis for projects of the rather little size of the LPW projects on the local level.

The Creation of Continuing Employment

During the debate on whether or not to establish the LPW program, program proponents argued that public works programs cause continuing employment gains.¹⁷ For example, after the construction of a sewerage treatment plant workers are needed to run and maintain the plant. The fallacy of this argument is that, even if additional workers are hired, the increase in employment may be offset by cut-backs elsewhere. If the increase in employment is not offset, taxes may be increased and private demand reduced.

Although this issue is clearly beyond the main focus of this project, CEAI surveyors did ask localities if they expected the projects to result in continuing operational, maintenance, or program expenses (savings). In general, this appeared to be an issue to which localities had devoted relatively little thought perhaps because for the types of projects financed by LPW the net changes were expected to be small. From the responses which were received, it appears that for approximately one-third of the projects a small increase in maintenance costs were expected. For another one-third only insignificant changes were expected. For approximately one-quarter of the projects a small decrease in maintenance and operation costs was expected. In most cases where the changes were judged small, no continuing changes in employment were expected. However occasionally the addition (elimination) of a maintenance position or the addition of a program director or elimination of an elevator operator position was expected. For the remaining projects (less than one-tenth of all projects) significant increases in program costs were expected as a result of the LPW projects. In these cases, substantial employment gains were also expected. For example in Passaic County, New Jersey, a major hospital renovation was undertaken which permitted an expansion of staff. However in most cases in which major increases in operation and maintenance costs were expected, the locality officials reported that the project (or a less expensive substitute) would have been undertaken even without the LPW program. In addition to the cases of complete substitution there were many cases in which a less expensive substitute would have been built in the fairly near future. Thus, there were few cases in which continuing employment gains could be attributed to the LPW program, even without considering the possibility of offsetting reductions elsewhere in locality budgets.

¹⁷ "Congressional Record", July 21, 1976 P. S12121-S12129.

Inflationary Impact

Fears that the LPW program would be inflationary¹⁸ appear to have been exaggerated. The net impact of the LPW program on the consumer price index was essentially zero. Nonresidential construction prices did rise somewhat. However, even here the net rise in prices was only about 0.1 percent. Furthermore, the impropitious timing of the LPW project contributed to its inflationary impact. Had the LPW program commenced 90 days after the earliest identification of the downturn, rather than when it actually occurred, the program would have had no inflationary impact in terms of consumer, producer or construction prices. The increase in inflation resulting from the higher demand would be completely offset by the reduction in prices resulting from a less severe recession.

¹⁸

"Congressional Record", July 21, 1976 P. S12128-S12129.

CHAPTER 9
DATA DEFICIENCIES AND SUGGESTIONS
FOR FUTURE RESEARCH

General Data Deficiencies

The Impacts of Federal Grants-in-Aid

A paucity of data exists describing the impact on local economic activity of federal grants-in-aid to state and local governments. While several studies designed to trace flows of specific types of federal expenditures through the economy have been commissioned, no comprehensive data exist indicating the extent to which particular types of state and local expenditures are financed through federal funds. Therefore, the extent to which local construction activity is influenced by federal (not to mention state) closed end matching grant programs is unknown. Specific areas in which data would be useful include: (a) quarterly estimates of federal grants by type of federal program, (b) estimates of the proportion of local government spending which is financed through matching and closed-end grants -- by type of grant and cumulatively, (c) estimates of the amount of state and local construction expenditures which are financed through non-categorical funds, such as revenue sharing and (d) ideally, estimates of federal (and state) contributions to local government expenditures by type of locality.

Local Economic Conditions

Perhaps the most shocking gap in our understanding of the U.S. economy is in the area of "small area" economics. Of course, the vast number of small areas makes data collection difficult and expensive. However, at some point a decision must be made as to whether or not the detailed "targeting" of federal programs is worth this cost. If such targeting is deemed appropriate, it is necessary to have accurate federal estimates of local economic activity, income, over-all employment, unemployment by type, and locality fiscal health (measured, for example, in terms of the ability to float bonds at the best available rates). This requires the systematic establishment of a mutually exclusive and exhaustive categorization of all the areas of the country based upon standardized criteria, including natural economic boundaries and political boundaries and jurisdictions. The Congress and the Executive Branch should agree upon the boundaries and data needs so that the data can best fulfill the needs of both branches of the government. The present maze of differences -- both in geographical coverage and political authority -- between the small area categories is not used for federal grant targeting. Thus, even the limited data available cannot be used effectively.

Construction Data

In 1978, construction will represent almost 9 percent of Gross National Product. Nevertheless, the data available on construction activity are among the poorest for any segment of our economy. Data on construction labor are particularly poor since the data are presently gathered on an establishment basis. Workers in particular skill categories are classified on the basis of the type of firm that employs them, rather than on the basis of their skill category. This leads to spurious reported changes in employment by skill category as workers change employers. Furthermore, since many firms consider themselves "general contractors", there is, in many cases, absolutely no way to estimate changes in employment by skill categories.

Another major problem with construction data is the woeful inadequacy of construction price deflators. The primary difficulty with these data is that the indices are based primarily on input costs and take no account of changes in productivity nor of the varying amounts of value added in construction of different types. Another major deficiency in the construction price data is that virtually all of the Commerce Department's composite construction indices depend upon private sector sources. These private sector sources often do not put the same high level of effort into data collection that we have come to expect from U.S. government agencies. The data gathered are often unrepresentative of types of construction. Furthermore, the construction index data, instead of viewing buildings in terms of their generic purpose, concentrate upon the types of construction materials which are used to construct the building.

Another major weakness in construction data is that the detailed data on the stock of, and new additions to, commercial and industrial buildings are collected by a private company, F.W. Dodge, rather than by the federal government. Since much of these data are proprietary, access to the data is severely restricted through the collection of fees which are far greater than the costs of distributing the data.

Estimates of the amount of employment generated by different types of construction activity are collected by the Bureau of Labor Statistics (BLS). However, the collection of these data is extremely sporadic. Part of the problem is incomplete coverage. Only a dozen construction categories are available in updated form. Among the major omissions are commercial and industrial buildings and renovation and repair activities. Other problems arise with the vintage of the data. Although BLS updates these data for productivity and price changes, the only primary information on the amount of employment generated by specific types of construction activity are, in many cases, 10 to 15 years old. Estimates of the use of materials in construction (and thus of indirect employment) must be based upon a 1967 input/output table. This input/output table is, of course, now 10 years old and cannot be expected to reflect present day materials use -- in either the manufacturing or construction industries -- with complete accuracy.

Some private sources, including CEAI, have endeavored to estimate the change in the input/output coefficients which have occurred during the past 10 years. These estimates, however, are based upon fragmentary data and do not substitute for a more timely, exhaustive study of the inter-industry relationships in our economy.

LPW - Specific Data Deficiencies

Much of our analysis of the LPW program was hindered by a lack of information concerning the actual flows of LPW funds. The two major aspects of this problem were that (a) the LPW program is still continuing, and thus much information concerning the flows of funds is at present unknowable; and (b) much of the data concerning LPW project applications, their disposition, and LPW disbursements were either unavailable, contained errors, or lagged actual events by several months. The explanation for these problems clearly lies in the vast amount of data which must be gathered and processed in a program designed to provide \$6 billion in relatively small grants. It must be recognized that sufficient resources simply were not available to check and clean the data as much as might be desirable from the point of view of a macroeconomic analysis.

Suggestions for Future Work

The Congress wisely decreed that a study of the economic impacts of the LPW program be undertaken so that, should the economy require another dose of counter-cyclical medicine in the future, an analysis of the value of public works funding would be available. To a large extent this evaluation answers many of the crucial issues regarding the macroeconomic impacts of LPW programs. Additional work could certainly be undertaken in terms of: (a) additional analysis of the timing of the spending impacts; (b) additional analysis of the exact employment creation impacts; (c) an expansion of the survey sample to include more localities and more projects; and (d) a more detailed investigation in some of the areas only briefly touched upon by the study. Moreover, an analysis conducted in 1980, after the program is complete, would be able to add precision to many areas in which CEAI was forced to provide estimates.

Perhaps the most important aspect of evaluation of the LPW program which remains to be undertaken is to compare and contrast the various types of counter-cyclical programs which were adopted in the wake of the 1973-1975 recession. This type of effort would integrate the results of studies of individual programs that have been undertaken by various arms of the federal government since 1973. Such an integration would be extremely useful in that it would identify the extent to which these programs are supplementary, complementary, overlapping, and inconsistent. It would also highlight the relative strengths of the different program designs in attaining individual policy goals. This work would greatly facilitate efforts to prepare comprehensive contingency plans for recession of alternative types and magnitudes.

Another issue which needs to be explored in much greater detail is that of project delay substitution, i.e. the extent to which local governments delay funding various activities because they believe that federal funds will be available in the near, or perhaps not so near, future. Delays could occur in response to anticipation of a specific program -- such as counter-cyclical public works -- or simply in the general hope of future funding. They can occur whether or not the project involved actually receives federal funding. Localities that significantly change their spending patterns on this basis are practicing an insidious form of grantsmanship, since locality effort for worthwhile projects is reduced as the localities await federal funds. If a counter-cyclic program is expected in the near future, the impact of the delay may peak just when the need for additional locality expenditures is the greatest. The potential impact of project delay substitution affects not only the LPW program, but also many types of federal aid and even tax policy. (In fact, general purpose construction grant programs may cause significantly less amounts of project substitution than an anticipated special purpose construction program.)

The Local Public Works program is a fairly unique type of countercyclical grant program. An inherent problem in its analysis is that only one observation of the impact of this type of program exists. Inevitably, "unusual" circumstances -- which were particularly severe in the wake of the 1973-1975 recession -- have acted to make it difficult to analyze the *ceteris paribus* impacts of the programs. Given the severity of the recession upon local governments, the change in the secular trend away from local government spending in general (and construction activity in particular), the crisis in some of the largest cities of our country, and the usually large amount of inflation experienced during this period, these results must inevitably be more tentative than if additional observations of an LPW-type program were available. It is almost axiomatic in economics that observations of a similar program -- either in the U.S. or elsewhere -- and an analysis contrasting the LPW program with these other programs, would provide additional information upon, and clarification of, the economic impacts.

Despite the inevitable data gaps and limit to the exploration of specific areas, CEAI believes that this study has answered many of the broad questions dealing with: (a) the speed at which countercyclical construction grant funds can be utilized; (b) the magnitude and types of the employment impacts; (c) the amount of substitution which can be expected; (d) the level and direction of inter-regional transfers; and (e) the feasibility and usefulness of targeting construction grant funds. Although further work would, of course, be useful, CEAI believes that in most cases, the answers to these questions contained in this study are within the range of permission necessary to provide a useful guide to the Congress and the Executive Branch in formulating future policy.

APPENDIX A

PROJECT TYPE AND CONSTRUCTION CATEGORY CLASSIFICATIONS

TABLE A-1

DEFINITIONS OF ACTIVITY CODES AND STRUCTURE CODES*

Type of Activity

- 1 CONSTRUCT, BUILD, CREATE, INSTALL (NEW CONSTRUCTION)
- 2 ADDITION, EXTENSION, EXTEND, EXPAND (NEW CONSTRUCTION)
- 3 REPAIR, REHABILITATE, RENOVATE
- 4 DEMOLISH, REMOVE (BUILDING OR FACILITY)
- 5 COMBINATION OF CODES 1 AND 4 (SECOND AND THIRD DIGITS)
WILL REFER TO THE TYPE OF STRUCTURE BEING BUILT
- 6 COMBINATION OF CODES 2 AND 3
- 9 MISCELLANEOUS CODES

Type of Structure or Facility

- 01 POLICE STATIONS
- 02 FIRE AND/OR RESCUE STATIONS
- 03 JAILS, PRISONS, DETENTION FACILITIES
- 04 MUNICIPAL OFFICE BUILDINGS, INCLUDING TOWN HALLS,
COUNTY COURTHOUSES, MULTIFUNCTION MUNICIPAL OFFICE
BUILDINGS
- 05 HOSPITALS, CLINICS, NURSING HOMES, HEALTH CENTERS,
SANITARIA
- 06 ARENAS, STADIUMS, BLEACHERS, PAVILIONS
- 07 AUDITORIUMS, THEATERS
- 08 GYMNASIUM, SWIMMING POOL, OTHER RECREATIONAL
BUILDINGS AND STRUCTURES
- 09 COMMUNITY CENTER, SOCIAL SERVICE CENTER
- 10 SCHOOL AND OTHER LEARNING OR TRAINING FACILITY
- 11 LIBRARY
- 12 MUSEUM, CULTURAL CENTER, SCIENCE CENTER, ART GALLERY
- 13 TERMINAL BUILDINGS (AIR, WATER, RAIL)
- 14 GARAGES, PARKING STRUCTURE (NOT PARKING LOT,
SEE #48)
- 15 FACTORIES, CANNERIES, PROCESSING PLANT
- 16 SHELL INDUSTRIAL BUILDINGS, WAREHOUSES, MARKETING
FACILITY
- 17 PORT FACILITIES, HARBOR DEVELOPMENT
- 18 AQUACULTURE FACILITY, FISH HATCHERY
- 19 ELECTRIC POWER PLANT, GENERATING FACILITY
- 20 DWELLING UNITS, HOUSES, APARTMENTS
- 21 HISTORIC BUILDINGS, REGARDLESS OF TYPE
- 29 MISCELLANEOUS STRUCTURES AND BUILDINGS NOT ELSEWHERE
CLASSIFIED
- 30 DAMS, LEVEES, DIKES, FLOOD CONTROL STRUCTURES
- 31 WATER LINES

*An EDA Work-Type Code consists of three digits. The first is an activity code. The last two are a structure code.

- 32 WATER SYSTEMS (LINES PLUS WELL, INTAKE, OR RESERVOIR AND/OR TREATMENT FACILITY, PUMPING STATION, ETC.)
- 33 WATER SOURCE DEVELOPMENT (RESERVOIR, WELL, INTAKE STRUCTURE)
- 34 WATER TREATMENT FACILITY (POTABLE)
- 35 SEWER LINES, MAIN, TRUNKS
- 36 SEWER SYSTEM (LINES PLUS OUTFALL, PUMPING STATION(S) AND/OR TREATMENT FACILITY)
- 37 SEWAGE TREATMENT PLANT, WASTEWATER TREATMENT FACILITY
- 38 COMBINED WATER/SEWER PROJECT
- 39 STORM DRAINS, EXCLUDING DRAINAGE DITCHES
- 40 DRAINAGE DITCHES, CANALS, AQUADUCTS
- 41 STREETS, ROADS, HIGHWAYS (MAY INCLUDE SIDEWALKS, CURBS, AND/OR GUTTERS)
- 42 SIDEWALKS, CURBS, AND/OR GUTTERS
- 43 COMBINED WATER/SEWER AND/OR HIGHWAY/STREET/ROAD AND/OR SIDEWALKS, CURBS, GUTTERS
- 44 SITE DEVELOPMENT (GRADING, CLEARING, ETC., PLUS INSTALLATION OF MULTIPLE UTILITIES)
- 45 FENCES
- 46 BRIDGES
- 47 RAILROADS, TROLLEYS, STREETCARS (INSTALLATION OF LINE, RAILS, ETC.)
- 48 PARKING LOTS
- 59 MULTIPLE UTILITY-TYPE FACILITIES, OR UTILITY-TYPE PROJECTS NOT ELSEWHERE CLASSIFIED

Miscellaneous Codes

- 989 RIGHT-OF-WAY CLEARANCE, GRUBBING, CLEARING, LANDSCAPING, PLANTING, RIVER, STREAM, CHANNEL, SHORELINE, OR DRAINAGE DITCH CLEARANCE
- 990 PARK DEVELOPMENT (CITY PARK, COUNTY PARK, ETC.) (PARKS OR RECREATIONAL FACILITIES INVOLVING MAJOR STRUCTURES SHOULD BE CODED UNDER #8)
- 991 INDIAN ACTION TEAMS
- 999 MISCELLANEOUS PROJECTS NOT ELSEWHERE CLASSIFIED

TABLE A-2
CLASSIFICATION OF WORK-TYPE CODES
INTO BLS CONSTRUCTION CATEGORIES

<u>Construction Category</u>	<u>Structure Type Codes</u>
Private Multi-Family Housing	20 ^b , 59-99 ^b ,
Private Single-Family Housing	20 ^b , 21 ^c , 59-99 ^b
General Hospitals	5
Elementary and Secondary Schools	6, 7, 8, 9, 10, 11, 50-99 ^b
Federally-Aided Highways	41, 42, 43 ^b , 45, 46, 47, 48, 59-99 ^b
Sewer Lines	31, 32, 33, 35, 36, 38, 39, 43 ^b , 59-99 ^b
Sewer Plants	34, 37
Civil Land Works	17, 18, 30, 40, 44, 59-99 ^b , d
Public Housing	20 ^b , 21 ^e , 59-99 ^b
Federal Office Buildings	1, 2, 3, 4, 12, 29, 59-99 ^b
Utilities	13, 14, 15, 16, 19, 59-99 ^b

- a) Last two digits of work-type code refer to Table A-1
- b) Structure type has been allocated to more than I-O category on a project-by-project basis.
- c) Includes all projects with work-type codes of 221 or 621.
- d) Includes all projects with activity codes of 4.
- e) Includes all projects with work-type codes of 121, 321, or 521.

TABLE A-3

ADJUSTMENTS OF BLS JOBS PER MILLION \$ ESTIMATE

(Construction Industry Jobs per \$ Million of Contract Cost)

Construction Category	1977 Estimate	Percentage Change 1976-1977	1978 Estimate	1979 Estimate	1980 Estimate
Private Multi-Family Housing	16.5	-13.2	14.3	12.4	10.8
Private Single-Family Housing	14.8	-11.9	13.0	11.5	10.1
General Hospitals	19.3	- 7.2	17.9	16.6	15.4
Elementary & Secondary Schools	16.0	-23.1	12.3	9.5	7.3
Federally-Aided Highways	18.0	-10.0	16.2	14.6	13.1
Sewer Lines	13.5	- 8.2	12.4	11.4	10.4
Civil Land Works	14.1	- 7.8	13.0	12.0	11.1
Public Housing	20.4	-12.8	17.8	15.5	13.5
Federal Office Buildings	17.5	- 7.9	16.1	14.8	13.7
Utilities	11.9	- 8.0	10.9	10.1	9.3

TABLE A-4

CLASSIFICATION OF WORK-TYPE CODES INTO INFORUM CATEGORIES

<u>Code</u>	<u>INFORUM Industry</u>	<u>Corresponding Structure Codes</u>
1	Single-Family Dwellings	20*
2	Multi-Family Dwellings	20*, 50-99*
3	Mobile Homes	20*, 50-99*
4	Residential Additions	20*, 21 (With Activity Code of 2 or 6)
5	Hotels, Motels	-----
6	Industrial	15, 50-99*
7	Office	4, 50-99*
8	Stores, Garages	14, 16, 50-99*
9	Religious	-----
10	Educational	9, 10, 11, 50-99*
11	Hospitals	5
12	Other Buildings	1, 2, 3, 6, 7, 8, 12, 13, 21, 29, 50-99*
13	Farm Construction	-----
14	Oil, Gas	-----
15	Railroad	47, 50-99*
16	Telephone, Telegraph	-----
17	Electric Utilities	19, 50-99*
18	Pipeline and Gas Utilities	50-99*
19	Misc Non-Buildings	50-99*
20	Highways	41, 42, 43*, 45, 46, 48, 50-99*
21	Military	-----
22	Conservation and Development	17, 18, 30, 40, 44, 50-99*
23	Sewer Systems	35, 36, 37, 38*, 39, 43*, 50-99*
24	Water Systems	31, 32, 33, 34, 38*, 43*, 50-99*
25	Residential Renovation/Alteration	20*, 50-99*
26	Combined Misc Non-Build/Highways	50-99*
27	Combined Highways/Sewers	43*
28	Combined Highways/Water	43*
29	Combined Sewers/Water	38*, 43*
30	Combined Highways/Sewers/Water	43*
31	Combined Other Build/Misc Non-Build	50-99*
32	Combined Other Buildings/Highways	50-99*
33	Demolition	(Activity Code of 4)

*Indicates Structure Code has been split by hand to several Input-Output Code categories:

- Structure Code 20 to Input-Output Codes 1, 2, 3, 4, and 25
- Structure Code 38 to Input-Output Codes 23, 24, and 29
- Structure Code 43 to Input-Output Codes 20, 23, 24, 27, 28, 29
- Structure Codes 50 through 99 to Input-Output Codes 2, 3, 6, 7, 8, 10, 12, 15, 17, 18, 19, 20, 22, 23, 24, 25, 26, 31, 32

APPENDIX B

SELECTED SURVEY INFORMATION

TABLE B - 1
SELECTED SURVEY QUESTIONS

Project-Specific Questions Pertaining to Substitution

What were your plans with respect to the (name) project if the LPW application had been rejected?

If you would have undertaken the (name) project anyway, when would the project have been started? (This year, next year, etc.) When would it have been finished? Would it have been fully funded?

How would you have funded the (name) project? (Tax increase, bond issue, transfer of funds from another capital project or other spending categories, capital or operating budget?)

Why was application made for LPW funds in the case of the (name) project?

Have you ever tried to fund the (name) project before? By what method? (bonding, etc.)

Questions on Rejected Projects

What are your plans with respect to this project now that your application has been rejected?

If you plan to undertake this project, how will you fund it? (Capital or operating budget) Would it have been fully funded?

If you plan to undertake this project, when do you plan to begin (have you begun) work?

Why was the application for LPW funds made in the case of this particular project?

Have you ever tried to fund this project before? By what method (bonding, etc.)?

Questions on Local Government Participation

How much money are you contributing to the (name) project? How much money is your parent government contributing to the (name) project?

How would these funds have otherwise been spent?

What expenses (operational, maintenance, or program - positive or negative) do you expect will be required as a result of the (name) project?

Questions on Bonds

When was the last bond issue in your jurisdiction?

What type of bond issue was this?

What was the fate of the last bond issue submitted to the voters? Passed;
Failed; Year?

If you needed money for a capital project, how do you think the community would feel about raising new taxes, floating a bond issue, etc? Are there any institutional reasons for not raising taxes or floating a bond? (Specify)

TABLE B-2

Distributions of Population and Survey Sample

<u>Criterion</u>	<u>Range or Category</u>	<u>Number in Sample</u>	<u>Percent of Sample</u>	<u>Percent of Universe a/</u>
Region	North Atlantic	19	38%	37.1%
	Great Lakes	10	20	19.5
	Middle South Atlantic	2	4	3.7
	South Atlantic	5	10	10.2
	Midwest	2	4	4.9
	North Pacific	2	4	3.2
	Southwest	10	20	21.3
	Total	50	100%	100.0%
Jurisdiction Type	County	6	12%	15.1%
	City	36	72	69.0
	School District	8	16	15.8
	Total	50	100%	100.0%
Population	0-50,000	26	52%	52.1% ^{b/}
	50,000-100,000	7	14	11.4 ^{b/}
	100,000-500,000	10	20	16.3 ^{b/}
	Over 500,000	7	14	20.2 ^{b/c/}
	Total	50	100%	100.0%
LPW Funds	\$0-200,000	11	22%	37.8% ^{d/}
	\$200,000-\$500,000	10	20	31.8 ^{d/}
	\$500,000-\$1,000,000	12	24	16.9 ^{d/}
	Over \$1,000,000	17	34	13.5 ^{d/}
	Total	50	100%	100.0%
SMSA	Yes	35	70%	e/
	No	15	30	e/
	Total	50	100%	

Notes:

- a) Fraction of all LPW funds (obligations) received by jurisdictions in this category, except as otherwise noted.
- b) Based on jurisdictions in the awards data base for which population data exist.
- c) Includes New York City. If this one jurisdiction's share of LPW funds is removed from the population class, the percent of the universe is approximately 14%.
- d) Percent of jurisdictions, unweighted by LPW obligations. These four obligation classes were assigned weights of 1, 1, 2, and 4, respectively. This brings the adjusted percentages of the classes to 23.6, 20.2, 21.5, and 34.3, respectively.
- e) The proportions of two-thirds SMSA and one-third non-SMSA, was requested in order to over-sample urban areas.

Components may not add to totals due to rounding.

APPENDIX C

SUBSTITUTION CROSS-TAB RESULTS

TABLE C - 1: DISTRIBUTION OF LEVELS OF SUBSTITUTION

(Number of Localities, by Level of Substitution)					Average Substitution
0%	2-16%	24-41%	49-50%	61-95%	100%
13%	10	10	7	5	5
					26.6%

TABLE C + 2
SUBSTITUTION, BY LOCALITY SIZE

Size Class (Population)	(Number of Localities, by Level of Substitution)						Average Substitution
	0%	2-16%	24-41%	49-50%	61-95%	100%	
0-49,999	10	2	6	3	1	3	25.6%
50-99,999	0	2	1	1	1	1	45.2%
100,000-499,999	2	3	2	2	2	1	14.3%
500,000 and over	1	3	1	1	1	0	24.6%

TABLE C - 3
SUBSTITUTION, BY LEVEL OF TOTAL OBLIGATIONS

EDA Obligations to Locality (\$1,000s)	(Number of Localities, by Level of Substitution)						Average Substitution
	<u>0%</u>	<u>2-16%</u>	<u>24-41%</u>	<u>49-50%</u>	<u>51-95%</u>	<u>100%</u>	
0-199	5	0	2	1	1	2	29.9%
200-499	3	0	1	1	2	3	56.1%
500-999	3	2	4	3	0	0	26.7%
1,000 and over	2	8	3	2	2	0	24.1%

TABLE C - 4
SUBSTITUTION, BY TYPE OF LOCALITY

Type of Locality	Q. 1	(Number of Localities, by Level of Substitution)					Average Substitution
		<u>2-16%</u>	<u>24-41%</u>	<u>49-50%</u>	<u>61-95%</u>	<u>100%</u>	
County	3	1	0	2	0	0	33.6
City	8	9	8	4	5	3	24.4%
School District	2	0	2	1	0	2	28.2%

TABLE C - 5
SUBSTITUTION, BY SMSA STATUS

Status	(Number of Localities, by Level of Substitution)					Average Substitution
	<u>0%</u>	<u>2-16%</u>	<u>24-41%</u>	<u>49-50%</u>	<u>61-95%</u>	<u>100%</u>
SMSA	8	9	6	5	4	3
Non-SMSA	5	10	4	2	1	2
						24.2%
						36.9%

TABLE C - 6
SUBSTITUTION, BY REGION

Region	(Number of Localities, by Level of Substitution)						Average Substitution
	0%	2-16%	24-41%	49-50%	61-95%	100%	
North Atlantic	2	3	4	4	3	3	35.0%
Great Lakes	3	4	3	0	0	0	10.4%
Middle South Atlantic	1	0	0	1	0	0	24.2%
South Atlantic 18	4	1	0	0	0	0	2.0%
Midwest	0	0	2	0	0	0	24.7%
North Pacific	0	0	1	0	1	0	52.4%
South West	3	2	0	2	1	2	32.2%

TABLE C - 7
SUBSTITUTION, BY DEGREE OF CONSTRAINT ON FLOATING BONDS

Evidence of Bond Constraint	(Number of Localities, by Level of Substitution)					Average Substitution,
	<u>0%</u>	<u>2-16%</u>	<u>24-41%</u>	<u>49-50%</u>	<u>61-95%</u>	
None	4	2	5	4	2	32.9%
Some	4	5	1	3	2	14.7%
Fairly Conclusive	2	1	2	0	1	43.7%

TABLE C - 8

SUBSTITUTION, BY RATIO OF LPW OBLIGATIONS TO LOCAL CAPITAL FUNDS

LPW Obligations ^a Local Capital Funds	(Number of Localities, by Level of Substitution)					Average Substitution	
	0%	2-16%	24-41%	49-50%	61-95%	100%	
0-0.5	5	1	0	3	2	1	41.2%
0.5-1.0	1	1	3	1	0	0	18.8%
1.0-3.0	2	0	0	1	1	1	12.6%
5.0-10.0	0	1	2	0	0	1	18.2%
10.0-100.0	5	1	0	0	0	1	12.5%

Local Capital Funds are defined as 1976 Capital expenditure, as reported in the written questionnaire, times the fraction of capital expenditure reported to be financed from local sources. Data were not available for 15 localities.

TABLE C - 9
LEVELS OF SUBSTITUTION, BY NUMBER OF PROJECTS

Number of Projects	0%	(Number of Localities, by Level of Substitution)				100%
		<u>2-16%</u>	<u>24-41%</u>	<u>49-50%</u>	<u>61-95%</u>	
1	10	0	1	4	1	4
2	2	1	5	0	2	0
3	0	3	1	2	0	1
4	0	1	0	0	0	0
5-9	1	3	3	0	2	0
10 and over	0	2	0	1	0	0

APPENDIX D: CHASE INFORUM RESULTS

TABLE D-2 DIRECT AND INDIRECT MATERIAL REQUIREMENTS PER DOLLAR OF CONSTRUCTION (Producer Prices)

1 CONSTRUCTION CATEGORIES RELIGIOUS									
1 AGRIC PRODU									
2 UTL SERV									
3 UTL SERV									
4 OTHER MINING									
5 FOOD PRODUCTS									
6 FLUOR CUMER									
7 UTL SERV									
8 UTL SERV									
9 UTL SERV									
10 MILL+WOOD PMU									
11 FURTHUR									
12 FURTHUR									
13 PAINTS									
14 UTH CHEM PROD									
15 PETRO PROD									
16 PETRO PROD									
17 PETRO PROD									
18 PLASTIC PROD									
19 LEATHER PMU									
20 GLASS									
21 GLASS									
22 PUTTY-CLAY PM									
23 CEMENT+CONC+GYP									
24 UTH STR+CLAY									
25 IRON+STEEL									
26 IRON+STEEL									
27 ZINC									
28 ALUMINUM									
29 NON-FERM+TMP									
30 UTH METAL PMU									
31 UTH METAL PMU									
32 DOLCH SHOPS									
33 UTH STUCC ET									
34 SCHE+MACR PM									
35 UTH FUL+PMU									
36 UTH FUL+PMU									
37 PILES+VALVES									
38 FARM+ET+NEC									
39 ENGINE+TUNG									
40 UTH+TUNG									
41 PAAT+MAUIN, NGR									
42 PUMPS+MLD+HS									
43 SERV INU MACH									
44 NON-ELEC+NEC									
45 NON-ELEC+NEC									
46 AP+PLANC									
47 LIGHT+AIR EU									
48 CUMMUN EQUIP									
49 ELEC+NEC									
50 ELEC+NEC									
51 INSTRUMENTS									
52 MISC MANUF									
53 TANKS SERV									
54 TANKS SERV									
55 WML+NET FRAME									
56 BUS+LEOL SERV									
57 UTH SERV+NEC									
FARM CONSTRUC									
UHL-GAS									
EXPLR									
HAILD									
CONSTR									
TELEPH+TELEG									

MATERIAL SUPPLIES

TABLE D-1 DIRECT AND INDIRECT MATERIAL REQUIREMENTS PER DOLLAR OF CONSTRUCTION (Producer Prices)

CONSTRUCTION CATEGORIES	RELIGIOUS	EDUCATION	MUSICALS	UTHE - HUDIS	FARM CONSTRUC	UUL*WAS	EXPLR	RAILROD	CONSTR	TELEPH-TELEG
1 AGRIC PRD	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
2 AGRIC SERV	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
3 AGRIC SERV	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
4 OTHER - WINING	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
5 FOOD PRODUCTS	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
6 FLOOD COVER	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
7 OTHER - EAT+APP	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
8 HOTEL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
9 VENER+PLY+M	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
10 MILL+WOOD PRD	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
11 FURNITURE	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
12 FURNITURE	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
13 PAINT+PAPER	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
14 UTH+CHEM PRD	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
15 PETRO PRD	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
16 PAYING+ASH	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
17 PLASTIC PRD	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
18 PLASTIC PRD	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
19 LEATHER PRD	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
20 GLASS	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
21 STUCC CLAY PH	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
22 STUCC CLAY PH	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
23 CEMENT+CONC+GYP	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
24 UTH+STN+CLAY	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
25 IRON+STFCL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
26 UTH+STFCL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
27 UTH+STFCL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
28 ALUMINUM	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
29 NON-FERR+ALF	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
30 UTH+METAL+PHO	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
31 UTH+METAL+PHO	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
32 UTH+METAL+PHO	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
33 UTH+STUCC+MET	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
34 SCREW+MERC+K	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
35 UTH+TOOL+PHO	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
36 UTH+TOOL+PHO	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
37 PLY+STUCC+ALF	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
38 FARM+PET+MERC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
39 ENGINE+STUCC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
40 CONST+MIN+OIL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
41 CONST+MIN+OIL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
42 PUMP+STUCC+OIL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
43 SE+V+IND+MACH	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
44 NON-ELEC+MERC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
45 NON-ELEC+MERC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
46 NON-ELEC+MERC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
47 LIGHT+TRIP+EG	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
48 COMMUN+EQIP	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
49 ELEC+MACH+OIL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
50 ELEC+MACH+OIL	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
51 INSTRUM+SVCS	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
52 MISC+MANUF	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
53 TRANS+SERVS	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
54 MACH+SERVS	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
55 MACH+SERVS	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
56 MACH+SERVS	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
57 UTH+SERVS+MERC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
58 UTH+SERVS+MERC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
59 UTH+SERVS+MERC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104
60 UTH+SERVS+MERC	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104	0.00104

MATERIAL SUPPLIERS

TABLE D-2 DIRECT AND INDIRECT MATERIAL REQUIREMENTS PER DOLLAR OF CONSTRUCTION (Producer Prices)

CONSTRUCTION CATEGORIES		ELECTRIC UTIL		PIPES+TIGS		UT		MISC NON-BUILD		MILITARY		CONSERV+DEVEL		SEWER SYSTEMS		WATER SYSTEMS	
1 AGRIC PROD	0.00133	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
2 AGRIC SERV	0.00183	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
3 STON-CLAY MIN	0.00036	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
4 LUMBER	0.00376	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
5 LUMBER PRODUCTS	0.00352	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
6 FLOOR COVER	0.00004	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
7 UTM TEXT+APP	0.00065	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
8 LUMBER	0.00330	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
9 LUMBER PLW	0.00345	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
10 FILL+ROAD PRD	0.00690	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
11 FURNITURE	0.00059	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
12 PAPER+PAPER	0.00169	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
13 PRINTING	0.00024	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
14 PETRO PROD	0.00187	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
15 PETRO PROD	0.00445	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
16 PAVING+ACRM	0.00263	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
17 WARMER PROD	0.00336	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
18 PLASTER+GYP	0.00038	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
19 PLASTER PROD	0.00426	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
20 GLASS	0.00035	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
21 STRUCT CLAY PR	0.00051	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
22 POTTERY	0.00135	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
23 POTTERY+GYP	0.00041	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
24 UTM STINGLAP	0.00176	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
25 NON-STEEL	0.00824	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
26 CUPEN	0.00362	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
27 ZINC	0.00302	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
28 ZINC ALUM	0.00278	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
29 NON-FERR AL	0.00278	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
30 UTM METAL+PHU	0.00345	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
31 PLUMING EQ	0.00087	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
32 ELECTRICAL	0.00087	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
33 UTM STRUCT	0.00517	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
34 SCH+MACH PH	0.00550	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
35 CUL+TOOL+HUM	0.00407	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
36 MISC FAB WIRE	0.00120	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
37 MISC FAB WIRE	0.00120	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
38 FARM PET+NEC	0.00950	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
39 ENGINE+TURN	0.00154	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
40 CUST+MIN+OIL	0.00250	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
41 PETRO PROD	0.00325	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
42 PETRO PROD	0.00234	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
43 SERV INU MACH	0.00192	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
44 NON-ELEC+NEC	0.00195	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
45 TRANS+P+MCH	0.00302	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
46 TRANS+P+MCH	0.00302	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
47 LIGHT+EQUIP	0.00444	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
48 CUM+IN EQUIP	0.00050	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
49 ELEC MACH+NEC	0.00047	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
50 TRANSP COMMO	0.00276	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
51 TRANSPORT	0.00045	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
52 MISC MANUF	0.00181	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
53 TRANS SERV	0.00576	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
54 HOUSEHOLD SE-VS	0.00512	0.00840	0.00537	0.00699	0.00699	0.00529	0.00736	0.00546	0.00712	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546	0.00546
55 MACH+NEC+TRD	0.00123																

APPENDIX E: SIMULATION OF TWO "NORMAL" RECOVERY PATTERNS

Examination of the "normal" impact of business cycles on construction related industries is complicated by the existence of federal counter-cyclical policy. Moreover, every cycle will contain some random events, which cause the recovery to differ from a "normal" cycle. Thus CEA has simulated two recessions, using its Macroeconomic Model and INPRO Model, to show the effects of a moderate and a severe business cycle on these industries. These two simulations are based on the actual historical cycles of 1970 and 1974, respectively, except that no federal counter-cyclical fiscal and monetary policies were assumed to have occurred, and no changes to the behavioral relationships in the model were made to reflect differences between actual events and the models' simulation of the time periods. The two simulations began in 1961.1 and 1974.1, respectively. The changes in actual federal policy that were entered into the models are summarized in Table E-1.

The impact of these changes was to increase the severity of the recessions and slow the path of the recoveries. The simulated recovery patterns for the economy in both simulations are described in Table E-2. The simulated changes in the industrial production indices of selected construction related industries are summarized in Table E-3 and Table E-4.

TABLE E-1
CHANGES FROM ACTUAL HISTORY

Policy	Simulations	
	1970	1974
Revenues	The Phase-out of the income tax surcharge in 1970 was revised as were the Phase II (1971) personal tax cuts. The investment Tax Credit was not re-instituted.	No changes in 1974. In 1975 and 1976 the tax reduction act passed in March was eliminated.
Expenditures	No changes were made as substantial cuts in purchases of goods and services were offset by above average growth in transfer payments. A large increase in social security benefits seemed to be related more to inflation than the slow real growth.	In 1975 and 1976 transfer payments to persons were reduced by approximately \$4.5 billion. Grants-in-aid were reduced by an amount which grew steadily from \$5 billion to \$18 billion, with 50% of the change being reflected in state and local expenditures. In 1976, Federal direct purchases were also reduced by \$3 billion.
Monetary Policy	Assumed steady 4% growth in the non-borrowed monetary base less currency.	Assumed steady 7.5% growth in the non-borrowed monetary base less currency.

TABLE E-2

PROFILE OF TWO HYPOTHETICAL RECESSIONS
(Change from NBER Reference Peak Value)

Variable	Time From NBER Reference Peak				
	2 Quarters	4 Quarters	6 Quarters	8 Quarters	10 Quarters
Industrial Production, Total					
1970 simulation	-.02%	1.3%	0.9%	5.0%	8.0%
1974 simulation	-1.4%	-5.0%	-8.9%	-7.6%	-5.3%
Constant Dollar GNP					
1970 simulation	0.6%	2.1%	3.6%	6.4%	9.3%
1974 simulation	-.02%	-1.4%	-2.4%	-1.0%	.07%
Unemployment Rate					
1970 simulation	.50	.70	1.16	.96	.86
1974 simulation	.76	2.04	3.26	4.10	4.56
Capacity Utilization					
1970 simulation	-2.2	-2.6	-4.8	-3.4	-2.8
1974 simulation	-3.9	-10.0	-13.0	-11.9	-11.0
Fixed Non-residential Investment (Constant Dollars)					
1970 simulation	-1.1%	-2.6%	-2.7%	-1.1%	2.4%
1974 simulation	-1.4%	-6.7%	-13.6%	-15.0%	-14.8%

TABLE E-3

DIRECT INPUT INDUSTRIES SERVING CONSTRUCTION, 1970 SIMULATION
(Percent Change in Industrial Production Index from 1968.4 Value)

Industry	Time From NBER Reference Peak				
	2 Quarters	4 Quarters	6 Quarters	8 Quarters	10 Quarters
Carpeting	-1.3	10.5	13.8	17.1	27.1
Lumber	-1.3	-0.8	-2.2	-1.3	-1.2
Lumber Products	-4.3	-1.1	4.1	6.8	13.3
Household Furniture	-1.3	1.7	5.7	7.0	13.4
Building Paper and Board	3.8	-3.1	-1.7	-1.0	3.7
Paints	-3.8	-3.4	-1.7	-5.9	-1.5
Plastic Products	6.7	5.1	12.8	17.4	31.0
Cement	1.6	-2.5	-1.3	0.0	3.2
Stone/Clay/Glass	-5.4	-6.1	-5.2	-6.2	-2.6
Concrete, etc.	-2.3	-8.5	-11.7	-11.6	-8.0
Copper	-2.6	-0.4	-9.4	1.7	-43.0
Aluminum	5.4	6.9	8.4	6.4	7.9
Nonferrous Mill Products	-1.2	-4.1	-10.2	-5.9	-6.5
Steel Mill Products	10.0	8.2	14.9	12.7	-7.8
Hardware	0.9	2.2	4.4	6.1	9.0
Major Electric Equipment	4.7	-2.8	3.9	6.8	10.3
Household Appliances	-4.7	-7.8	3.7	2.0	10.5
Miscellaneous Appliances	0.4	-2.1	6.3	5.9	11.5

TABLE F-4

DIRECT INPUT INDUSTRIES SERVING CONSTRUCTION, 1974 SIMULATION
(Percent Change in Industrial Production Index from 1973.4 Value)

Industry	Time From NBER Reference Peak				
	2 Quarters	4 Quarters	6 Quarters	8 Quarters	10 Quarters
Carpeting	-1.0	-3.6	-20.3	-22.9	-11.9
Lumber	-19.4	-20.3	-26.4	-31.2	-26.3
Lumber Products	-0.9	-1.7	-19.9	-14.9	-4.2
Household Furniture	1.7	-1.1	-15.3	-22.7	-6.0
Building Paper	0.6	1.6	-2.3	-15.5	-7.9
Paints	-0.8	0.4	-0.3	1.3	3.0
Plastic Products	7.6	14.6	7.1	-0.1	7.1
Cement	3.2	-6.9	-12.0	-16.8	-15.6
Stone/Clay/Glass	0.3	-6.4	-15.0	-28.4	-29.8
Concrete, etc.	3.9	4.2	-2.8	-17.9	-7.7
Copper	-3.6	-10.1	-4.6	-25.4	-21.8
Aluminum	4.3	10.8	10.9	-14.5	-15.9
Nonferrous Mill Products	8.4	5.8	-21.5	-39.0	-28.3
Steel Mill Products	10.4	5.7	2.1	-19.2	-19.9
Hardware	3.1	6.2	-2.0	-9.9	-5.5
Major Electric Equipment	3.4	2.9	-0.7	-12.1	-14.4
Household Appliances	3.1	-3.6	-16.0	-25.4	-18.7
Miscellaneous Appliances	1.0	0.9	-17.0	-22.1	-14.6

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